RIG

Remote Imaging Group

ISSUE NUMBER
36
MARCH '94

EARTH

CONTENTS MARCH 1994

Officers 1994		2
Chairman's waffle	Henry Neale	3
Exhibition and conference on remote imaging		5
From the editor	Peter Wakelin	6
Looking back.... The early soviet weather satellites	Peter Wakelin	7
Automatic scanning control for the Cirkit receiver	Mark Pepper	10
Weather satellites in war against locusts		13
Polaroid to facsimile	Les Currington	14
Interpreting weather satellite imagery - part 7	Peter Wakelin	17
JVFAX V6.0 update	Mark Pepper	25
Packet news - RIG WXSAT bulletin	Mark Clarke	27
Submission of items for publication and copy deadlines		28
Pictures from OSCAR 21	Mark Clarke	28
A comparison of three image display systems	Colin Schulz	30
A home-brew digital barometer	Mike Goodall	32
Meteor 3-5 comes to life once more	Geoff Perry	34
OKEAN satellites - The last secret?	John Murray	36
Product News		40
Meteosat news notes	John Tellick	41
Archiving WXSAT images on the PC	Les Hamilton	42
Slow-Scan infra-red imagery from Meteor 3-5	Les Hamilton	43
The Archimedes image library		45
Questions & Answers		46
1994 renewals - comments	Ray Godden	48
RIG GIF library	Peter Wakelin	50
Shareware corner	Les Hamilton	52
The Soviet and Chinese scene	Peter Wakelin	57
Kepler elements		60
Members' letters		61
RIG at rallies		63
RIG helplines		64
RIG shop corner		66

Cover images: Description on page 41
Centre pages: Predictions courtesy Simon Goodall

REMOTE IMAGING GROUP — OFFICERS 1994

CHAIRMAN	Henry Neale, G3REH Thornlea, Fishergate, Sutton St James, Spalding, Lincs. PE12 0EZ Tel: 0945 85353
SECRETARY	John Tellick 34 Ellerton Road, Surbiton, Surrey, KT6 7TX Tel: 081 390 3315
MEMBERSHIP SECRETARY	All membership enquiries Ray Godden, G4GCE Wayfield Cottage, The Clump, Chorleywood, Herts. WD3 4BG Tel: 0923 720714
TREASURER	Mark Clarke, G3CQL 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ Tel: 0787 374128 (7pm-9pm) Fax: 0787 475029
JOURNAL EDITOR	Peter Wakelin 1 Charters Road, Ascot, Berks. SL5 9QF Tel: 0344 23200 Fax: 0344 26028
MAKE-UP EDITOR	Mark Pepper 9 Hornbeam Close, Heath Park, Camberley, Surrey, GU15 4UE Tel: 0344 777730 (7pm - 9pm)
RALLY AND EXHIBITION COORDINATOR	Dave Cawley Fieldfare, Wickhambrook, Newmarket, CB8 8QA Tel: 0440 820040
ADVERTISING MANAGER	Michael Gill 3 Turnbridge Close, Cutbush Grange, Lower Earley, Reading RG6 4UZ
COMMITTEE	Frank Bell, Les Currington, Chris Kaley
RIG BBS RIG PACKET	Tel 0945 85666 (300Bd to V42 MNP2-4 & V42bis MNP5) G3CQL @ GB7SFK - "RIG WXSAT BULLETIN"
Published by Printed by	The Remote Imaging Group (RIG). VAT Registration No. 594 7483 83 St. George's Press, Reading.

CHAIRMAN'S WAFFLE

HENRY NEALE

You have kept our membership secretary busy during the first few weeks of the year. Over a thousand members renewed by the 20th of January! We have refrained from processing the cheques until the new year so that there isn't a large a carry forward of monies from the 1993 accounts into 1994. RIG is in a moderately healthy position financially and we do have to maintain that position. We are in a difficult position this year in that the AGM is extremely early and the accounts might not be available in their final form. We are very sorry that it is so early and that it might not be as convenient as in previous years. This is beyond our control and we ask you to be tolerant and bear with us. We shall have to see if the arrangements can be modified next year.

It was with great sadness that I received the resignations from both James and Mike, just as the last Journal was about to be printed. They gave the group the maximun time possible to get replacements. I and the committee are extremely grateful to them for all the work that they did, all the improvements in quality, style, content, image and even the punctuality. I can honestly say that I never regretted the day I asked them both to do their respective jobs. I chose the right people. However, life goes on and I now have the pleasure of introducing their replacements.

I thought that a new Journal Editor would need several skills and abilities etc. Plenty of time is one thing most of us don't have. The right equipment is also high on the priority list. Someone who is already well known and into weather satellites up to their elbows. The first person that came to mind and filled as many of these qualifications as possible was Peter Wakelin. He is well known to you from his articles on meteorology and has just retired from a career in forecasting. He has both PDUS and HRPT equipment. I asked Peter if he would consider taking the post and after a short time he rang me to say that he would be pleased to be considered for the post.

For the Make-up Editor's post, we needed someone who has the necessary skills for handling fonts, layouts, design etc. We already had Mark Pepper on the PC and Printer Help-lines. He works for a well known printer manufacturer, in their trouble shooting team. He is technically well into printers and should be the right man for the job. Needless to say they were both co-opted into their respective posts at the December committee meeting. We all look forward to seeing the fruits of these new appointments.

Whilst on the subject of printing - the quality of print in RIG35 was not up to our

usual standard. The printer - AbbeyPrint were very sorry for the low quality of the last Journal and offered their appologies - it was something to do with under exposing the plates trying to get the black and white pictures to print properly. Because of this and the changes in the Editorial team, it was thought advisable to change printers. St. George's Press at Reading are now charged with printing the Journal and we eagerly await the results.

The Electronic Bulletin Board is as busy as ever. 4700 callers since March 1993. Some people have great difficulty accessing it but others seem to walk right through it. Speeds of 14,400 baud are more common now and several at 12,000 baud. It might go even faster but I haven't seen it actually going faster. I have downloaded 300 Kbytes in 90 seconds but that was an uncompressed file. I am now putting any newsflashes on the opening pages - recent launches etc. so don't let them flash by without a glance - there might be some hot news there! Keplers are updated on a Sunday or Monday evening at present but I have yet to find a foolproof way of indicating exactly when. Perhaps just the date when I have updated them is sufficient. You can then decide if they are worth downloading. If you have more recent releases of the programs - please upload them. We try to keep up to date with recent releases but are not always successful. There has been some more noise on the lines recently but I am expecting the exchange to go digital in the next few months which should clear up all the "rubbing together of bits of metal problems". There has been enough BT vans there in the last few weeks to make one from discarded equipment! Still they get it right some of the time!

When you purchase equipment from RIG please contact myself or one of the other Helpline contacts before contacting the manufacturer. We purchase the equipment at advantageous prices on your behalf, but on the condition that we provide first line backup. We may know of some recent problem that has appeared that only needs a change in the settings to correct it. Please contact us first. The despatch system has changed recently and it appears to be working extremely well. You carry on as you have been doing but when the orders come through to me, I simply pass the orders on to others, to despatch to you. Peter Wakelin and Michael Gill are doing this at present. This relieves me of all the hassle of finding boxes etc. They do that and only have to stick labels on and get them to the Post Office. It has certainly saved me a lot of time and might be developed further.

I am hoping to meet many of you at this year's rallies, of which there should be a list later on in the Journal. If you think that I am on my own and overworked, why not join me and meet other RIG members. It is surprising how interesting it is and the many faces that turn up. I actually like to have a look around the rally myself but this often doesn't happen. We usually manage to get 2 or 3 committee members to attend most rallies but there are always the small ones

where I go on my own - that is when I might need the extra help.

Thats about all I can find to waffle on about this time and as I am late again I had better wrap it up. I hope that we all might get a bit better weather than we have been having just lately. It would be nice if mother nature could get it in the right order for a change!

Best wishes
Henry ●

ROYAL GRAMMAR SCHOOL, GUILDFORD - EXHIBITION AND CONFERENCE ON REMOTE IMAGING

Date :- 9.00 am to 4.00 pm Saturday 30th. April 1994

Location :- The Royal Grammar School, GUILDFORD Surrey

V.I.Ps. :- Dr. P. Ryder, Director of Operations at the Met Office will be opening the conference and the Rt. Hon. William Waldegrave PC MP, Minister of Science, has been invited to come at some stage during the day.

Exhibitors :- All the main UK manufactures of hardware and software have been invited to provide a display of their latest products. These include Dartcom, Spacetec, NRSC, BNSC, Timestep and others.

A programme of mini lectures will be on offer. Lectures will range from a beginners' guide to meteorological satellites, through primary data, to how does synthetic aperture radar work?

RIG members are welcome to come bearing in mind that the main bias will be towards education; but the images and equipment are the same for all.

If you wish to attend you must pre-register by sending a S.A.E. with details of delegates to Mr. F.J.Bell, Royal Grammar School, High Street, GUILDFORD, Surrey, GU8 5AB. A programme will be sent to you about two weeks before the conference.

Attendance is free, some car parking in the school is available and light refreshments will be available at cost. Guildford is easy to reach by rail or road. ●

FROM THE EDITOR'S DESK

PETER WAKELIN

When I retired from the Met Office three years ago I anticipated spending the rest of my days tending my extensive collection of desert plants and looking at, listening to and receiving images from satellites. It hasn't worked out like that at all but I am not complaining. Two hours in an operating theatre last March to fix a long-standing disk problem made me feel 20 years younger so I was happy to give more time to RIG but that telephone call from Henry last November came as a great shock and even now I am not certain that I made the right decision. In time, I hope you will think I did.

On behalf of all members I express thanks to James and Mike who over the last 3 years have not only transformed the Newsletter into a highly respected Journal but have succeded in getting it out on time every time. Mark and I have a hard task ahead to maintain the standard and with the move to a new printer as well we may not get the first one to you by the beginning of March.

Another major change our predecessors made was to introduce colour to the Journal. Several members now have the means to produce multi-spectral images and we have seen a few examples of their experiments in these pages. The fact that professional meteorologists still look at monochrome images (except in a few specialist areas) suggests that this is a difficult area in which to make colour work to our advantage. Keep on with the experiments!

Inevitably, a new team will have new ideas and even this first issue will look and "feel" a little different but that does not, of course, mean that we didn't like what went before. One change I would very much like to see is an increase in the proportion of contributions from non-committee members. I know there's a lot of talent and expertise in the remote imaging and allied fields out there so please get tapping on your key-boards and let us all share your knowledge.

Mark Clarke's station profile went down very well with readers and I hope to make this a regular feature. This time Les Currington, one of RIG's founder members reveals everything. I would welcome further contributions to this series but I can't guarantee everyone the 24-bit colour treatment! A new feature is "Looking Back..". This month sees the 25th anniversary of the launch of Meteor 1 so I take a look at the early years of the Russian weather satellite programme. Recent events aboard Meteor 3-5 have prompted a couple of articles so, all-in-all, this issue has a distinct Russian flavour which extends to the colour pages too. I hope you like it. ●

LOOKING BACK....THE EARLY SOVIET WEATHER SATELLITES

Peter Wakelin

Meteor 1 was launched 25 years ago, on 27 March 1969, and although it was the first satellite to be given the Meteor name, the Soviet weather satellite programme began much earlier. The Cosmos label was introduced in 1962 and it soon became apparent that it was a coverall name for a wide range of both military and civilian spacecraft. Great secrecy surrounded the Soviet space programmes in those days and failures were rarely admitted; they were disguised under the Cosmos name. Western analysts acquired snippets of information from press and radio broadcasts and international scientific gatherings often revealed further pieces of the puzzle.

Cosmos 4, launched in April 1962, was a military observation satellite but it was later announced that it also televised cloud images for the first time. The earliest known experiments directly related to weather satellites were launched on Cosmos 14 on 13 April 1963 but it was not until nearly 5 years later that it was revealed that this spacecraft was a test bed of systems for the orientation and stabilisation of weather satellites and for testing power supplies using solar-powered batteries.

Cosmos 122 was launched in mid-1966 and 7 weeks later the Russians acknowledged that it was an experimental weather satellite. As Cosmos 44, 58, 100 and 118 all flew in similar orbits to Cosmos 122 it seems reasonable to assume that Cosmos 44, launched on 28 August 1964 was the prototype of the operational series of Meteors. Meteor 1 was announced as a weather satellite only a day after launch and was given a description indistinguishable from its Cosmos predecessors.

The early weather satellites were launched from the southern cosmodrome at Tyuratam into 65 degree inclination orbits at about 640 Km altitude. Cosmos 144 was the first to go out of Plesetsk where the higher latitude makes launching into polar orbits more efficient in terms of energy requirements. It achieved an 81 degree orbit at about the same height so was the first to be capable of global coverage. The 5th Meteor, launched on 23 June 1970, was the first to enter a 900 Km orbit which was later to become the standard.

The instrumentation on the first-generation Meteors included TV cameras and scanning radiometers and data were transmitted to three sites at Moscow, Novosibirsk and Kharbarovsk. Meteor 10, launched on 29 December 1971, was the first to carry automatic picture transmission (APT) and it was compatible with the American system. It was also the first to test ion-plasma low thrust (less than 0.5N) engines for orbital adjustments.

Some satellites in the Meteor series were identified as being "experimental" and data from Meteor 18 were also received at the State Centre for Research of Environment and Natural Resources as well as the Hydrometeorological Centre implying that additional instrumentation was on board. Later, Meteor 25 was referred to as Meteor-Priroda (Nature). Meteors 28, 30 and 31 were similar but were launched into retrograde, sun-synchronous orbits similar to the present NOAA satellites. More energy is needed to launch into a retrograde orbit than a direct one so these craft were placed in 640 Km orbits and because of launch azimuth constraints at Plesetsk these Meteors went from Tyuratam. To attempt a sun-synchronous launch southbound from Plesetsk would result in a trajectory passing over populated areas including Moscow and a northbound one would possibly be misinterpreted in the USA.

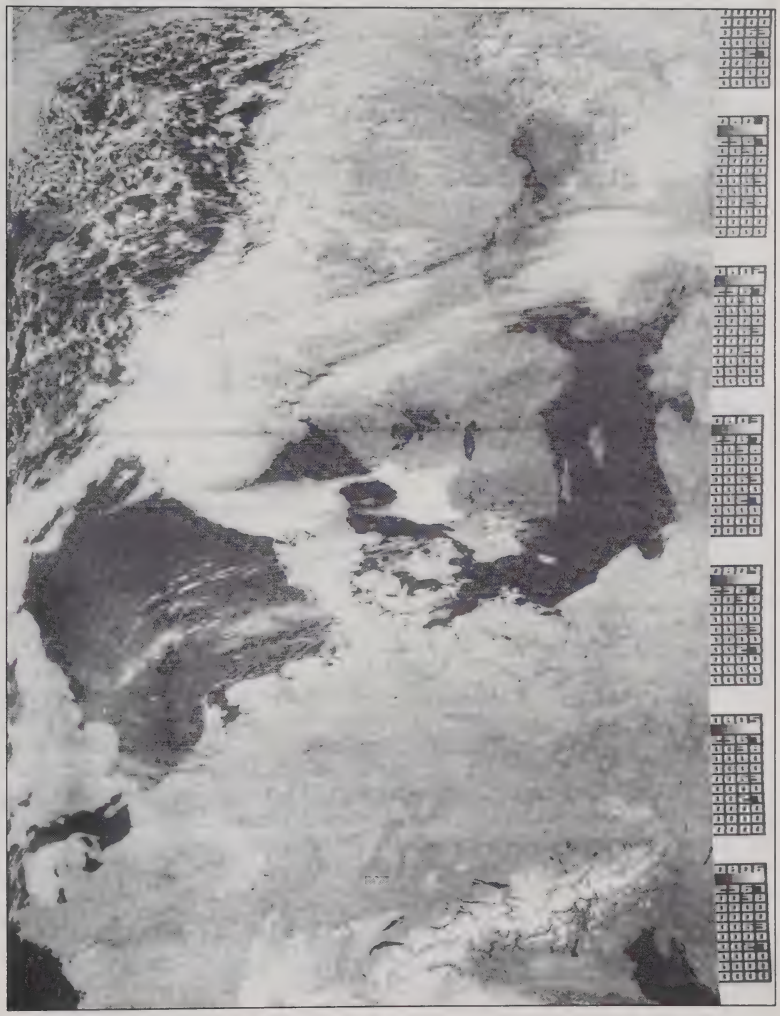
The first of the second-generation Meteors was launched on 11 July 1975 with improved on-board equipment according to the Russians. The use of the 81 degree (later 82.5 degrees) non sun-synchronous orbit continued though. No doubt the Russians would have preferred the sun-synchronous orbit with its plane fixed relative to the direction of the sun but perhaps that orbit at the preferred 900 Km was not possible with the available launch vehicle. These Meteor 2s were the first to have the now familiar six-bit analogue binary code beside the images. This edge-code correlates well with solar illumination at the sub-satellite point on earth and varies from 10 when the solar elevation is above about 75 degrees to the maximum 63 when the sun's elevation is about 8 degrees. It is probably used in the automatic exposure mechanism. Western amateurs received infra-red imagery in the 137 MHz band from several of the second generation Meteors but it was of low resolution and seldom lasted more than a few weeks. It is possible that imagery was also transmitted at a higher frequency. The launch of Meteor 2-21 was probably the last in this series.

The Meteor 3 series started in 1985 with the launch of Meteor 3-1 on 24 October. The IR imagery from these is very much better and at the greater height of 1200 Km are the highest of the polar-orbiting weather satellites.

Les Currington kindly allowed me to look through his extensive collection of images and select one to accompany this article. My chosen one was received from Meteor 30 on a pass over Western Europe on 27 March 1982. The time can be determined from the numerical edge-code which includes a "clock". The top number in each one-minute frame advances by one in successive frames and is a count of minutes after midnight, Moscow time. So this pass began in the north 800 minutes after midnight, or 1020 GMT. Some readers may notice a similarity between this image and the visible light images received from the more recent Okean missions.

Much of the above has been extracted from Geoff Perry's contribution to "Soviet

Space Programs: 1976-80 (with supplementary data through 1983)", US Government Printing Office. Washington DC, May 1985 and I am grateful for his permitting me to use it. ●

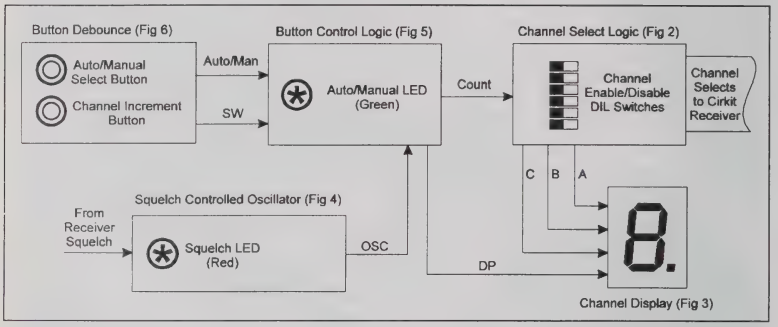


AUTOMATIC SCANNING CONTROL FOR THE CIRKIT RECEIVER

Mark Pepper

The Cirkit VHF Weather Satellite Receiver has been available for many years and is currently available in both kit and ready built form for around £50 and £75 respectively (Winter 93/94 catalogue). The unit is a 6-channel receiver. The user supplies the PSU, case, antenna and connecting hardware. A rotary switch is provided with the receiver for channel selection, the individual channel frequencies being set by plug-in crystals. This article provides a number of circuit blocks which, when used together, add push-button controlled scanning with channel display and selective channel disablement. Both manual and automatic scanning are supported with full display of scanning and squelch status.

Fig 1 Connection Diagram

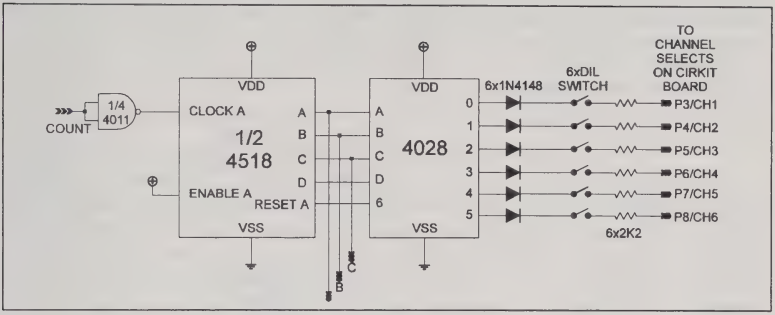


The circuit consists of five blocks connected as shown in figure 1. The circuit is built around a counter/decoder section based on one half of a 4518 binary counter and a 4028 BCD to decimal decoder (figure 2). Pulses arriving at the clock input of the 4518 cause the 4028 to step through the six channels one by one, cycling back to channel 0 after channel 5. The DIL switches provide a simple disabling facility by stopping the associated channel being selected. The outputs from the 4028 drive the channel select lines of the Cirkit receiver high, one at a time, thus selecting one of the receiver's six oscillator sections. BCD channel information is taken from the 4518 and drives a 4511 seven-segment display driver (figure 3). This displays the currently selected channel number from 0 to 5.

The counter is driven by clock pulses provided by the gated oscillator shown in figure 4. This oscillator runs at around 0.5Hz. The frequency is not too critical, as long as the frequency chosen allows stabilisation of any squelch circuitry and

of the channel circuitry selected. The oscillator is stopped when the squelch input, via the 1N4148, is taken to low. P14 from the Cirkit receiver provides a suitable squelch signal. The squelch state is indicated by a red LED. ON means that a signal is present.

Fig 2 Channel Select Logic



Figures 5 and 6 comprise the button control circuitry. Two buttons are used, one to switch between manual and automatic channel scanning and the other to perform manual channel incrementing when in manual mode. Both buttons are debounced by the circuitry in figure 6, the channel increment button also being inverted by a single transistor. Outputs from figure 6 feed the count select circuitry in figure 5. This circuitry selects count pulses from either the gated oscillator (figure 4) or from the channel increment button. Which input is selected and fed to the counter (figure 2) is determined by the output state of the other half of the 4518 used in figure 2. The manual/automatic button toggles the state of the A output of the 4518, alternately selecting the gated oscillator and channel increment button output via a two to one multiplexer constructed from a 4011 quad NAND. The mode condition is indicated by a green LED with ON indicating automatic scan mode.

Fig 3 Channel Display

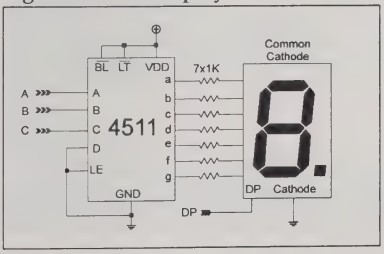
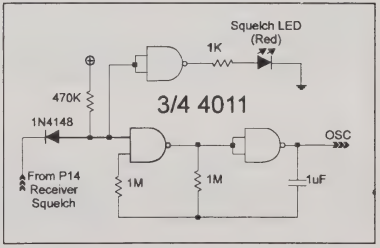
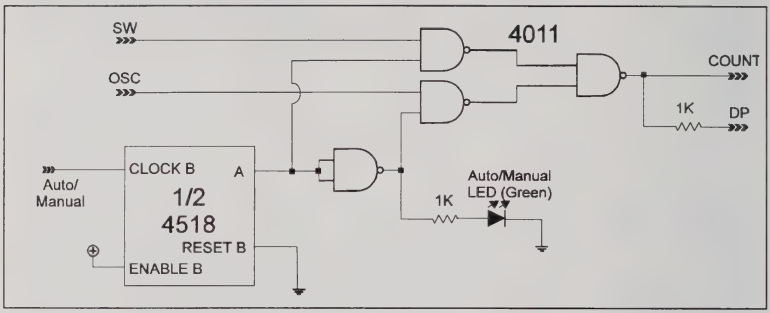


Fig 4 Squelch Controlled Oscillator



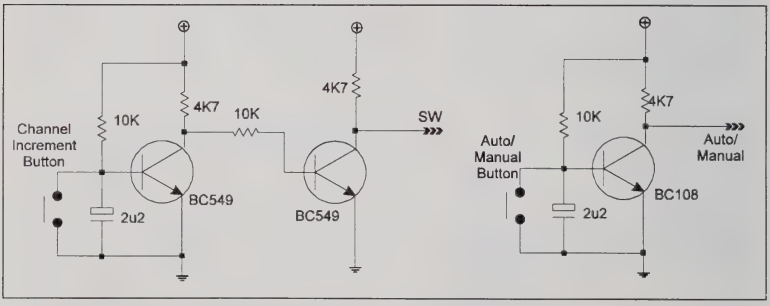
The debounce circuitry (figure 6) is used to ensure that when a button is pressed, only a single pulse is sent to the counter or auto/manual register. The transistors can be any general-purpose NPN devices such as BC549s. I use two buttons that incorporate LEDs within the body of the switch (Maplin JU04E/JU05F). The green mode LED is fitted to the automatic/manual scan button and the red squelch LED is fitted to the channel increment button. The decimal point of the seven segment LED display is used to display the status of the scan pulse. This has no obvious use but only uses one extra resistor.

Fig 5 Button Control Logic



The entire circuitry is designed to run from the same 12V supply as the Cirkit receiver and should not present too many constructional problems. No pin numbers are given to encourage modification and experimentation.

Fig 6 Button Debounce



I did all the construction on a short piece of Veroboard and wired everything together with miniature, plastic-coated, single-cored wire. As a suggestion for

construction, I fitted the receiver board into a 160x100x35mm screened case (Cirkit 21-71013) and then fitted this into a larger, 203x178x63mm, ABS instrument case (Cirkit 21-15984) along with the scanning circuitry, signal strength meter (see RIG 2), tone-sensitive squelch circuit (RIG 23&25), 12V regulator, down-converter channel switch circuitry and all the necessary PSU, audio, computer and antenna connectors. I used an external "power cube" style DC supply to keep any mains away from the receiver unit. The 6-way DIL switch, seven-segment display and control switches were mounted on the front panel along with the volume and squelch controls provided by the Cirkit receiver. ●

WEATHER SATELLITES IN WAR AGAINST LOCUSTS

New Scientist (8 January 1994, p7) reported that the UN's Food and Agriculture Organisation (FAO) has been using low-resolution weather satellite imagery in its work on the control of locusts in Africa and the Middle East. Before you rush to check your images for bugs read on!

Obviously the resolution of these satellites cannot detect individual insects and even the largest swarms would not be dense enough to see from space. What the satellites can detect are the areas of new grass that appear after even a light fall of rain. The locusts feed on this grass and if enough of the well-fed creatures breed then huge swarms may develop which can devastate crops over a vast area.

The FAO's policy is to detect these new-growth areas then send teams in to spray pesticides on the vegetation before the locusts breed. However, the programme is not succeding very well due to local wars and inadequate transport. ●

FOR SALE
Timestep PDUS system comprising HEMT preamplifier, receiver, PC data card and software, cables, manual etc. excellent condition. Offers around £775. Contact Paul Chamberlain G4XHF. Tel. (0293) 515201 evenings or (0622) 696437 day.

FOR SALE
TY-STAR 14" Colour Monitor, 1024x768x256 0.28 pitch. Originally purchased from Timestep. £85 + £10 delivery...unless collected. Contact Trevor Smithers (G0KTN), Melksham, Wilts on 0225 703726 after 6pm.

POLAROID to FACSIMILE
25 Years of a fascinating Hobby

Les Currington G8LOK

In writing this station profile I will endeavour to explain "how I got the bug".

A report in a technical journal stated that a local American religious group were able to obtain pictures from space using home-brew equipment and showed a picture of their results. That was enough to set my inquisitive mind working. I modified a Quad FM HiFi receiver and in a short space of time I was receiving my first satellite signals and beginning to learn about orbits.

I plotted the length of the pass against the time the signal was received each day on graph-paper. After several days I was able to make a fairly accurate estimate of when the next pass would be.

At about this time several articles began to appear in the technical press showing how it was possible to obtain weather pictures from space on a set-up similar to the one that I was then using - the signal applied to the Z-modulation input of an oscilloscope, a 4 Hz source to the X-plates and a picture frame obtained by applying a chargeable capacitor to the Y-plates. With a Polaroid camera held in place by a suitable mounting plate and focused on the screen, if I was lucky, it was possible to obtain reasonable pictures.

It was difficult at times to know the names of some of the satellites other than by making a phone call to the Appleton Laboratory at Slough. As I was not a scientific establishment it was not always possible to get a reply.

The main breakthrough for me was in 1975-76 when a series of articles appeared in Wireless World describing the construction of a "home-brew" fax machine which made it possible to obtain prints on photographic paper. This, of course, was just what I required. I contacted the author (now Dr) Gerry Kennedy and, with his advice and suggestions, I was soon able to produce prints of ever-increasing quality. That was also the start of a continuing friendship.

Soon, another friend was added to the circle when Gerry asked me to contact the Rev James Brown, who wished to build his first fax machine. Ideas were exchanged, quality improved and interest increased.

At about this time, in July 1980, I visited the Open Day at Kettering Boys School and met the well-known physics master, Geoff Perry. A common interest developed to our mutual advantage - exchanging my pictures for his data. By

the end of that year I had been absorbed into his Kettering Group of (amateur) space observers.

Print quality was still my main aim and this was pursued still further when James obtained two old Muirhead fax machines. James, being a generous chap, allocated one of them to me. I decided to strip it of all the electronics, leaving only the solid base and drum. A stepper-motor drive was added to the drum and traverse and the black-level and contrast- drive to the crater tube were all controlled from a new control panel. Print-quality greatly improved and auto-control of picture-alignment meant that the drum was in full sync with the satellite directly the signal was received .

At the RSGB VHF Convention at Sandown Park, during the Spring of 1985, our Henry Neale decided to book a table to assess the degree of interest in weather satellites. A wide range of prints by Henry, James and myself was displayed and the interest was so great that RIG was born.

I was now several years into retirement and concentrating my viewing on the excellent pictures transmitted by Russian satellites. The various different formats and unpublished details, presented an even greater challenge for the reception and identification of signals. It was then that a new chapter developed in print-production. Typical prints from the Meteor series were passed to Geoff and some were used in technical publications such as Nicholas Johnson's *The Soviet Year in Space* and Interavia's *Space Directory.*

On 3 September 1990 I received signals from a newly-launched Chinese satellite. On the following day I printed an image from a near-overhead UK pass. The climax came on the next day when I went, with Geoff, to the Farnborough Air Show. There I had the great pleasure of meeting Si Xuewu, the Deputy Director of the Space Affairs Division, Department of International Cooperation of the Chinese Ministry of Aero-space Industry, and Wang Lu, of the China Great Wall Industry Corp. I told them about the launch and presented them with a print from Feng Yun 1-2.

I hope this will give hope to members who are about to retire, and to new members wishing to get more involved with their hobby. If you cannot buy - try building it. There is always some one who is only too willing to help. Through my hobby I have corresponded with people all over the UK and in many parts of the world, greatly adding to my interest.

Bibliography

Baylis P E and R J Brush, Contrast expansion processor, *Wireless World*, December 1973.

Clayton G B, Experiments with operational amplifiers for logarithmic conversion, *Wireless World*, January 1973.
Kennedy G W, Weather satellite ground station, *Wireless World*, November 1974.
Kennedy G W, Weather satellite picture facsimile machine, *Wireless World*, December 1976.
McKnight C H, Evolution of an amateur weather station, *QST*, 1968.
Osborne J M, Receiving weather pictures from satellites, *Wireless World*, October 1971.

Equipment used

Scanning receiver covering the 136-138 and 440-470 MHz bands using two switchable phaselock demodulators - the well-known versatile 4046 and Plessey SL6601.

Meteosat converter based on a design by DK1VA, *VHF Communications*, 1985.

Meteosat/HRPT converter with four channels based on the above DK1VA design and suitably modified.

Frame store - the original design by YU3UMV, *VHF Communications*, 1982.

Facsimile drive unit with the following facilities:- separate control of the visible channel using a log amplifier enabling enhanced ground detail; separate control of the IR Channel for contrast expansion; channel blanking when separately printing either IR or visible; crater tube brightness control with auto shut-off until the picture is received.

HRPT phase demodulator consisting of IF amplifier, phase demodulator and comparator with TTL output to computer.

Aerials are an X-phased omni-dipole J Beam, a 5-element crossed-Yagi with azimuth and elevation control, and the horn shown in RIG 32 with azimuth and elevation control.

R M personal computer 802086, 4Mbyte RAM, 130 Mbyte hard drive with added Timestep PROsat II card and HRPT data control card. ●

FOR SALE
Logitech Scanman 256 grey scale hand scanner for IBM PC. Including latest FotoTouch image editing software and PC interface card. Boxed and as new. Offers around £120. Contact Mark Pepper. Tel 0344 777730 after 7pm.

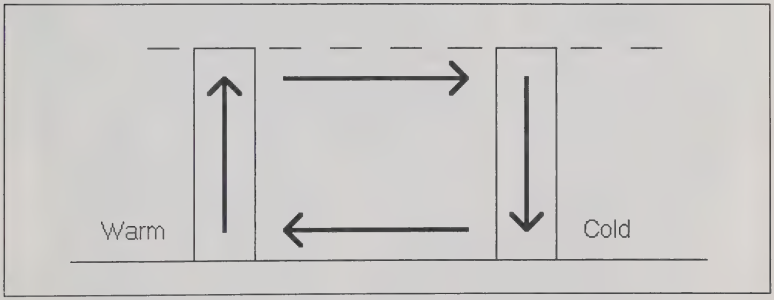
INTERPRETING WEATHER SATELLITE IMAGERY - PART 7

Peter Wakelin

In this issue I shall show how careful study of a whole-disk image from a geostationary satellite can show the large-scale atmospheric "engine" at work. Then, primarily for the benefit of newer members, I shall zoom in to north temperate latitudes and take another look at that common feature, the frontal depression.

In any study of the large-scale circulation of the atmosphere the starting point must be the unequal heating of the Earth's surface by the sun. Consider two columns of air of equal height, one over the hot, equatorial region and the other at high latitude (Figure 1). Assuming that the pressure at the base of each column is the same then the pressure at the top is the surface pressure less the weight of air in that column. As the column of warm air is less dense than the cold one it also weighs less. Therefore the pressure at the top of the warm column must be higher and air will try to flow toward the cold column. However, this motion can only take place if there is ascent in the warm air and descent in the cold with a compensating surface flow from cold to warm.

Figure 1.

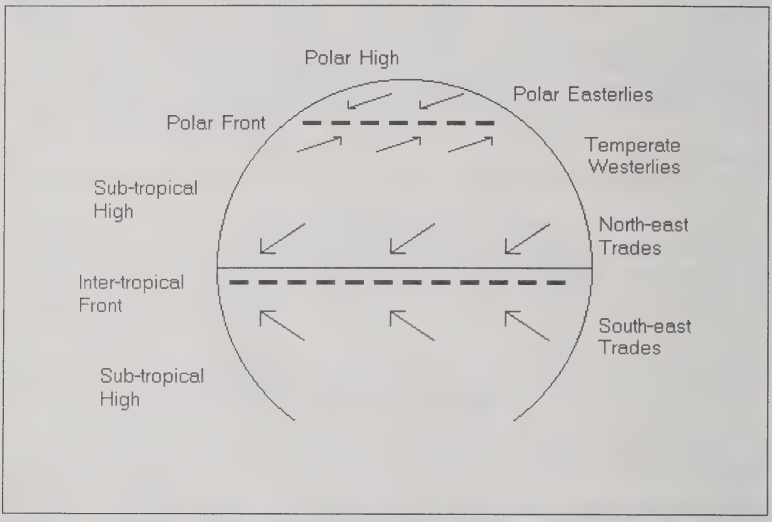


If the real atmosphere followed this simple model then all surface winds would blow from the poles toward the equator. This clearly does not happen and the reason why is because the Earth's rotation has been ignored. A detailed explanation would be far too lengthy but consider briefly what would happen to a parcel of air above Entebbe, on the equator in Uganda, setting off on a journey down a pressure gradient toward Cairo. Entebbe is moving eastward at 465 metres per second due to the earth's rotation but Cairo, being nearer to the axis of rotation is moving at only 403 m/s. Therefore, if our parcel of air neither gained nor lost energy on its journey, it would have an easterly component (relative to the ground below) of 62 m/s added to its velocity by the time it

reached 30 degrees north. That is well above hurricane force! Despite the simplicity of the above model, it does have its counterpart in the real atmosphere. The rising air in equatorial regions travels polewards but descends in the sub-tropical belts around latitude 30 degrees.

Figure 2 is a simplified diagram of the mean surface wind direction and pressure over the Earth. If the great land masses on our planet were broken into many small islands and distributed evenly over the globe, then the departures from these means would probably be very much smaller than they really are. The continents with their mountain barriers and the major oceans with their circulating currents are the reasons for the huge variation in climate and weather at places having the same latitude.

Figure 2.



The areas of descending air are the high pressure zones in the sub-tropics and the polar regions. Here, the descending air flows outwards at the surface in a clockwise direction in the northern hemisphere and counterclockwise in the southern hemisphere. If you find the change in direction confusing then consider what would have happened to our parcel of air if it had moved down a pressure gradient toward Durban instead of Cairo. It would still gain an increasing easterly component which is a deflection to the left, or counterclockwise. Conversely, in the northern hemisphere, air converges

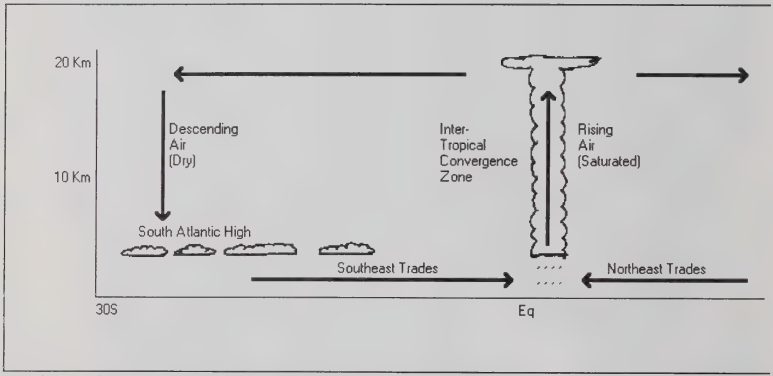
METEOSAT 4 IR 0800 UTC
7 DECEMBER 1993
POLAR FRONT
60
AZORES HIGH
30
INTER-TROPICAL CONV ZONE
0
SOUTH ATLANTIC ANTICYCLONE
30
ITCZ
ITCZ
ITCZ

counterclockwise into low pressure areas, or depressions, and the vertical motion within them is upward.

Whenever air rises it expands and cools. If it cools sufficiently for its water-vapour content to become saturated then cloud droplets will form. Conversely, when air descends, it warms and any water or ice it holds will evaporate. Therefore, we would expect areas of rising air to be cloudy and areas of descending air to be cloud-free.

My images are from Meteosat 4 at 0800 on 7 December 1993 and are both infrared from the primary, digital data channel. The whole-disk image is flattened to utilise maximum monitor display area and as the pages of this journal are also rectangular, I have not attempted to correct the distortion. At the time of the image it was high summer in the southern hemisphere and the sun was overhead just to the east of Madagascar. Consequently, southern and eastern Africa and the Arabian peninsula have had several hours of sunshine and show up very dark (hot) compared with NW Africa. There, after a long winter's night, the land has cooled to below the sea temperature and therefore appears a lighter grey than the ocean.

Figure 3.

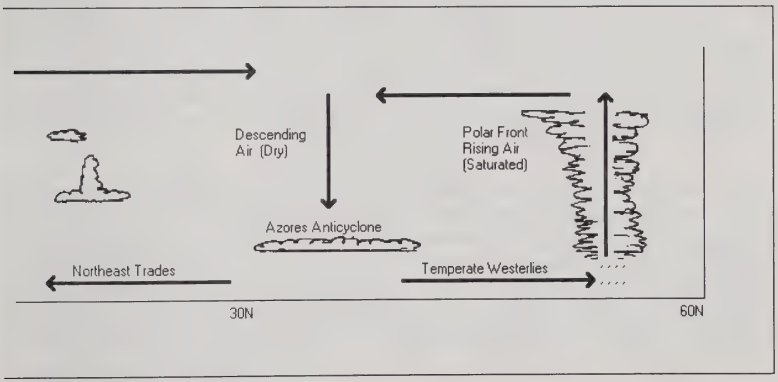


At first glance, the cloud structure over the globe may appear to be entirely random and somewhat chaotic. Try to visualise the image in three dimensions; white clouds are coldest and highest, light grey are warmer and lower and very low clouds can be difficult to distinguish from the surface.

Clearly, tropical Africa is largely cloud-covered with low and medium level clouds and scattered areas of cold, high clouds. To the west, much of the South

Atlantic Ocean is covered by a layer of low cloud. Note the appearance of the high (white) clouds in the tropical regions compared with those in temperate latitudes. The vast areas of high clouds in temperate latitudes are mainly associated with depressions along the polar fronts where air may be ascending over an area 2000 Km or more across. Near the equator the necessary pressure gradients cannot exist for depressions to form and evidence of converging air is seen as relatively small areas of bright clouds where vertical motion is rapid and extends to great heights. The associated rainfall is intense and often accompanied by thunder. These areas often join to form lines of severe weather for hundreds of kilometres along the Inter-Tropical Convergence Zone (ITCZ) as it is called. These lines are usually more prominent over the oceans whereas over land, where larger surface temperature variations occur, the ITCZ is usually less well defined as over Africa in this example. A more noticeable line is evident in the Atlantic, just north of the equator and there is a well organised band on the extreme right of the image near the Chagos Islands.

In the past, many aircraft have flown into these lines and not emerged from the other side. Modern aircraft with weather radar sometimes deviate from their planned course to avoid them and as the cloud tops can reach well over 20 Km, Concorde occasionally had to take avoiding action when it was in regular service to Singapore.



The best place to illustrate the areas of rising and descending air described above lies in the Atlantic Ocean. Figure 3 represents a pictorial cross-section of the probable cloud structure along longitude 20W between latitudes 30S and 60N. The vertical scale is very greatly exaggerated compared with the horizontal scale. The large area of uniform grey cloud in the South Atlantic is associated with the permanent South Atlantic anticyclone. Here, the air is descending,

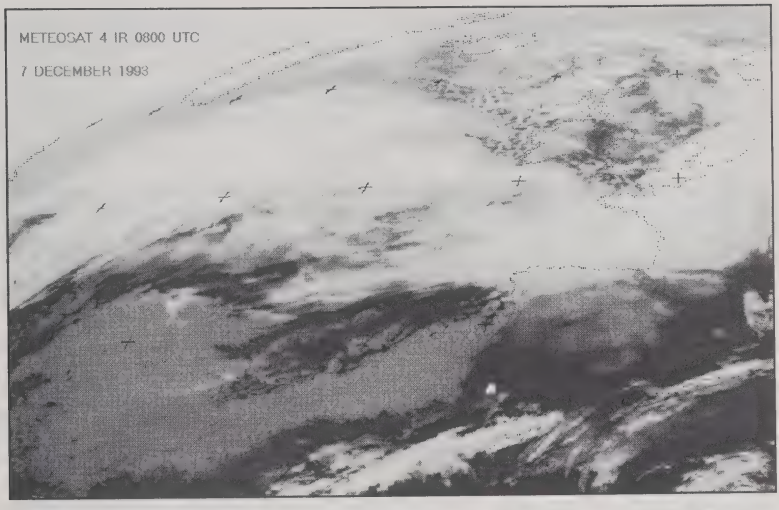
hence very dry but it is not cloudless right down to the surface because the warm sea is evaporating and there is sufficient convection to overcome the general descent in the lowest 1500m or so.

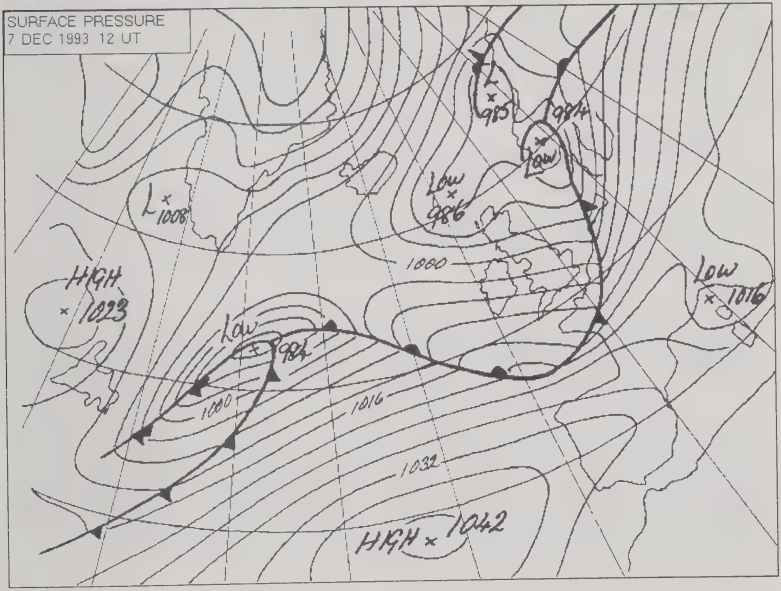
Just north of the equator lies a narrow band of brilliant white cloud (hence the tops are cold and high), which has resulted from the convergence of the moisture laden SE trade winds blowing out of the South Atlantic anticyclone and the NE trades blowing down the W African coast. Further north, near the Canary Islands, lies an area of less bright cloud and from its lumpy appearance these dry islands are probably getting a welcome winter shower. The large area of medium-grey cloud near 40N is a sheet of stratocumulus associated with the semi-permanent Azores anticyclone. As in the S Atlantic high, the air is descending and very dry and cloud is confined to the lowest kilometre or two. Note that although this cloud appears lighter than that in the S Atlantic anticyclone and is therefore colder, it may not be higher. Remember it is winter in the northern hemisphere. Further north still, lies a great mass of high cloud associated with the polar front which is the northernmost area of mass ascent of air.

Before going in to more detail about polar fronts and depressions a few words about tropical depressions would be in order. These form on the equatorial side of the high pressure belt and almost always between latitudes 8 and 25 degrees. In the N Atlantic, Pacific and Indian Oceans they are known as hurricanes, typhoons and cyclones respectively. They do not form in the South Atlantic Ocean because the sea surface does not quite reach the requisite temperature due to the vast amount of cold water brought northward by the Benguela current off the coast of Africa. A temperature in excess of 27C and copious quantities of very humid air are needed to trigger their formation.

The polar front marks the boundary between the cold, polar air and air originating in lower latitudes. These airmasses can exist side-by-side with not a lot happening but, sooner or later, the boundary becomes distorted, warm and cold air are pushed together and, if conditions are right, the surface pressure starts to fall and a depression is born. As cold air is more dense than warm air it will either undercut the warm air and force it upwards or else the warm air will ride up over the cold. In both cases the warm air rises with all the consequences mentioned earlier.

Imagine figure 1 representing two columns of air not thousands of kilometres apart but close together on either side of the polar front. The pressure difference at the tops of the two columns is considerable over a relatively short distance, that is, the pressure gradient is large. Also, consider the difference in speed of points on the surface at latitudes 50 and 60 due to the Earth's rotation. It is 67 metres/second, which is larger than the earlier example for Entebbe to Cairo


METEOSAT 4 IR 0800 UTC
7 DECEMBER 1993


SURFACE PRESSURE
7 DEC 1993 12 UT
L
985
994
Low
986
L
1008
1000
HIGH
1023
Low
984
Low
1016
1000
1016
1032
HIGH 1042

produced for a distance three times larger. So, not only is there a large pressure gradient across the tops of the columns but a given pressure gradient leads to a stronger wind than at lower latitudes. These narrow belts of strong winds, the jet-streams, reach maximum strength at around 10 Km altitude and inevitably lie more or less parallel to active fronts. Speeds in excess of 100 m/s are not unknown.

The surface pressure chart reproduced here is based on the midday 7 December chart broadcast on HF fax from Bracknell. Note how the fronts match the shape and position of the frontal cloud on the image. The large area of cold, high cloud in the North Atlantic results from the mass ascent of air in the depression. The cloud link to the depression over Scandinavia is also well defined. The larger scale image of the eastern Atlantic and NW Europe shows this link in more detail.

Winds blow counterclockwise around depressions in the northern hemisphere and approximately along the direction of the isobars. However, there must be some cross-isobar flow inwards, in the case of depressions, as air is rising and must be replaced.

The front over NW Europe is being pushed southeastwards by the colder northwesterlies and is thus a cold front, traditionally coloured blue or marked with triangular symbols on the forward side. The passage of a warm front, not surprisingly, introduces warmer air and they are coloured red or annotated with semi-circles. When a cold front catches up a warm front and all the warm air has been pushed up off the surface the front is said to be occluded.

The cloud to the northwest of Britain is quite different in character to the frontal cloud. The direction of the isobars suggests a high-latitude origin for this air so it is very cold yet the sea is still quite warm. Note how dark (warm) the Irish Sea is compared with the adjacent land. Heating this very cold air from below causes violent, local convection and the result is typically cellular clouds. Occasionally, as in this example, a small depression forms in the polar airstream and then there is convergence and larger-scale ascent of air in addition to violent convection. Very heavy falls of snow and hail can occur in these situations but in this case the severe weather over Scotland was short-lived as the next Atlantic depression brought milder air the next day.

The most satisfactory way to study the large-scale circulation of the atmosphere is by watching an animated sequence of images from a geostationary satellite. An hourly sequence of images for a period of several days can be very enlightening and no two sequences are the same so I can guarantee that, unlike on that other rectangular screen, you will never be bored by endless repeats. ●

JVFAX V6.0 UPDATE
Mark Pepper

[Due to a misunderstanding, the wrong paper was printed in RIG 35. Here is the correct version, with further updates. It was also erroneously stated that version 6.0 would be the last. Development work is continuing. Ed.]

I have just received JVFAX version 6.0, revision 931201. The package has been extensively updated in many areas, both AM and FM and SSTV all have new features. The following is a short list of some of the more notable changes:

- Picture masks for prettier geostationary satellite images.
- Contrast/brightness adjustment and histogram equalisation for image post processing.
- Automatic movie generation of zoomed images.
- Phasing for NOAA satellite transmissions.
- PC clock time correction when receiving Meteosat images.
- DTR line switching by software, facilitating receiver channel changing.
- "True" squelch mode with noise detection for the unattended reception of low
- orbiting weather satellites.
- Up to 192 dates in one date-file for timed reception.
- Transmit and receive SSTV in the most commonly used modes.
- Generate transmit audio on the TxD line.
- Up to 20 definable FAX modes.
- An additional 640x480x256 movie mode for users of ET4000 graphics cards.
- ALT-X instant exit hot-key implementation.
- ALT-Y external program starter hot-key implementation.
- External image conversion program access added to convert to GIF format.

As discussed at some length in the author's (E Backeshoff) own review (RIG 33), JVFAX has comprehensive support for both AM and FM FAX as well as Slow Scan TV (SSTV). However, although many features have been improved, I will only discuss those pertinent to the remote imaging side of the program.

As soon as V6.0 was installed, I connected my Meteosat receiver and decoder to my serial port (see "Automatic Scanning Control for the Cirkit Receiver" elsewhere in this issue for details). Setting my Trident video card and the correct interface type in the configuration menu was easy and a mere three or four button presses later I was in FM FAX mode just before a D3 Meteosat 4 image was due. To my amazement, not only did JVFAX synchronise and start

displaying a picture immediately, but the picture was in full colour. The picture had the greenest land, bluest sea and greyest cloud I have seen, and not a hint of those mysterious islands of green or flooded continents usually found with other colour attribution systems when the weather is bad. I've tried many other packages and their colour options, and even tried colour combination experiments, but I have never had such a good colour picture so quickly. The secret behind the colouring system, which sets it apart from the other PC based packages I have tried is "masks". The following is an edited extract from the JVFAX document file describing masks.

"When receiving weather pictures, the low contrast between sea and land is often a problem if you want to colour the images. If you're receiving images from geostationary weather satellites such as Meteosat, there's a simple solution to this problem; masking. While an image is being received, a mask file is overlaid on to the incoming data. The mask is a black and white image of the area being received with all the land areas black and the sea areas white. By this method, the intensity levels of selected areas of the picture are shifted to enable easier colour palette modification. By choosing an appropriate palette one can then colour the land and the sea areas of a picture independently".

The next feature I experimented with was the movie option. This, as usual, facilitates the animation of multiple images, ideally, but not exclusively, from the geostationary satellites. You could, in theory, animate polar satellite passes but the movie produced would be a bit of a mess. The first, striking difference between JVFAX animations and others from comparable packages is that JVFAX animations can be in colour. My first colour animation certainly impressed both my wife (spouse approval is a very important factor for future expansion) and also my work colleagues.

Although, at the time of going to press, I have not done extensive testing with polar orbiters (mainly due to their being no suitable passes during the short time I have in the "lab" these days), JVFAX now supports synchronisation with the polar orbiter's tone bursts. You can toggle synchronisation between normal, inverted, Meteor, NOAA visible, NOAA IR and NOAA all (both IR and vis together). Squelch mode has been improved too and now incorporates noise detection as well as mere signal detection. This intelligently starts the decoding when a signal is detected, almost removing the need for a hardware squelch.

Two nice little features; firstly, when receiving Meteosat APT, JVFAX will use the image start transmission time to tweak your PC clock. It will nudge the seconds to the correct value if your clock is anything up to 30 seconds out. Secondly, if using a serial input system the DTR line can now be switched by software. This proves ideal for automatic, remote Meteosat channel switching.

As with V5.2, details of a simple AM/FM decoder and a SSTV transmitter are included in the documentation along with a few addresses of companies in Germany that can supply ready made boards. I also understand that Martelec, in the U.K., are producing a competitively priced, microprocessor controlled decoder with remote receiver control facilities.

For those not familiar with JVFAX, it's FREE (The author asks only for feedback and an amount of money of your choice to support further development), supports both AM (for HF FAX), FM (for geostationary and polar orbiters) and SSTV reception. It supports a whole list of video cards at up to 1024x768x256 colours, can print to almost any printer (not postscript) and provides hundreds of knobs to twiddle should you be so inclined. One big difference between it and some of its competition is that JVFAX supports many different ways of getting APT signals into your computer. It can accept data from serial and parallel ports allowing the user to chose the decoder of his choice. It does not require a dedicated internal interface so should be attractive to PS2 microchannel and portable PC users.

It must be said that compared with other APT packages JVFAX does not support longitude and latitude gridding and temperature calibration (maybe V7.0 will!). So a serious user, aiming to extract the maximum information from an image would probably be looking at a ready made, plug in and go system of the PROsat, Omni FAX/PRO or OFS FAX varieties.

So many attractive features are available in JVFAX that it is difficult to describe them all in such a short update. The disc-based documentation runs to nearly 70 pages and should be consulted for a more in-depth description of available functions. The package is certainly worth looking at, especially as the only cost involved would be postage or telephone charges. ●

PACKET NEWS - RIG WXSAT BULLETIN

Mark Clarke G3CQL

Well, after the previous month's problems with my PC's hard drive RIG's packet news is now up and running again. Thanks to all of you who dropped me a line now and again. At least some people are reading it! Apologies to our European members who have sent packets to me recently. I am attempting to send our bulletin into Europe under "EU" but, for some unknown reason, my local BBS is not forwarding. I am looking into the problem.

RIG Keplers are now on packet - under "KEPLER" - "RIG WXSAT KEPS". They will be updated every two weeks and are taken from the RIG bulletin board. ●

SUBMISSION OF ITEMS FOR PUBLICATION AND COPY DEADLINES

Please send contributions to the Editor. Although typed and hand-written items will be considered we would prefer longer pieces to be on a PC disk in one of the popular word-processing formats, ideally in WordPerfect. Drawings and diagrams may be submitted on disk, preferably in a Windows Meta File compatible format, but please send hard copy also. To reproduce well, satellite images must have a good range of tones. Contact the Editor for further information.

COPY DEADLINE FOR THE JUNE ISSUE: 25 APRIL 1994

Advertisers' copy is required by 18 APRIL 1994 and should be sent direct to Michael Gill (address on page 2). ●

PICTURES FROM OSCAR 21

Mark Clarke G3CQL

Has anyone seen pictures from Amsat-DL's OSCAR 21- RUDAK? In December I downloaded a packet from Richard, G3RWL @ Amsat who sent a message to RIG members inviting them to use their equipment to disseminate fax pictures from the spacecraft.

Richard has told me that the polar-orbiting satellite has been termed a "multimedia" satellite. The pictures are uploaded and stored in JPEG format and during transmission are are converted to WEFAX format using a RTX-2000 RISC processor to keep memory usage to a minimum. The satellite's downlink frequency is 145.987MHz and the WEFAX format is like the METEOSAT WEFAX specification: FM, 2400Hz sub-carrier with double sideband AM modulation, a 300Hz start tone for 3 seconds, a 450Hz stop signal for 5 seconds and an 800x800 pixel image with 256 grey levels at 4 lines/sec. Other modes used are Phone and Packet.

As the transmission spec. is similar to that of Meteosat, I have successfully disseminated using my FT290R Mk1 with a 6-element quad and both PROsat II and my YU3UMV framestore although, in both cases, I have had problems trying to lock to the edge-strip which is possibly due to the Doppler effect as the spacecraft passes overhead.

The picture currently being sent (and reproduced here) is one of the spacecraft itself. The satellite may not transmit WEFAX all the time as the new medium is very much in its infancy.

See page 60 for Kepler elements. ●

ИНФОРМАТОР 1
Buon Anno
Bonne Année
Feliz Año Nuevo
Glückliches Neues Jahr
Счастливого Нового Года

A COMPARISON OF THREE IMAGE DISPLAY SYSTEMS

Colin Schulz, Western Samoa

The following brief observations are made after comparing Timestep's PROsat II, QFAX from Quorum and the OFS system.

EASE OF USE - PROsat II is best all round as everything seems to work as expected and is in a logical sequence. QFAX is fairly simple and most things work well. OFS takes some practice as it seems a bit illogical in places.

ADJUSTMENTS - PROsat II has only manual adjustment of input level. QFAX and OFS have auto-adjust of peak whites.

PROsat II and QFAX have fixed sampling rates but this is adjustable on OFS.

GRIDDING - PROsat II works well if clock and elements are good and is the only one to grid Meteors correctly. OFS permits adjustment of the grid to fit known land features and includes coastlines as does QFAX.

TEMPERATURE MEASUREMENT - PROsat II appears to use an average set of parameters for all NOAA satellites but is within a few degrees around here. OFS's temperature readout is messy to calibrate but uses unique data for each satellite. Not yet available on QFAX.

CONTRAST STRETCHING/ENHANCING - All provide some degree of enhancement. PROsat II and OFS use palettes.

COLOUR PALETTES - The PROsat II system is best and colours can be adjusted fairly easily. OFS comes second with no colours on my version of QFAX.

AUTO-RECORDING - PROsat II and OFS both have facilities for recording at set times. QFAX has the best system for polar orbiters. The parameters for gridding and the satellite name are automatically stored with the saved image after the pass.

RECEIVERS - PROsat II and OFS require external receivers. QFAX has its own RX on board but the software has to be running for the receiver to operate.

RESOLUTION - Here I think PROsat II comes last with the other two about the same. I compared images of Western Samoa received from NOAA 9 on consecutive days and the Timestep one was noticeably more pixelly. OFS was set at 2048 samples per line and PROsat II at 800 (I think). I could not try the QFAX at this time as someone had borrowed it but it seems to be as good as the OFS picture. Theory states that the sampling rate should be at least twice the

frequency to be sampled. So if the video frequency of the picture is up to 1800 Hz then it would seem correct to sample at not less than 3600 per second or 1800 per line in the case of NOAA satellites.

CONCLUSION

I like the PROsat II for ease of use for manual acquisition, OFS for best resolution and QFAX for best unattended operation. If only the best features of all three could be combined! ●

RIG 35 - Errata

A Low-cost 137 MHz Receiver - schematic. The junction of C14 and C15 should connect to TR2 collector. A 10nF capacitor is required in series with the line 'Demod sig'. Pin3 of IC4 should connect to pin3 IC5.

RIG 35 - Apology

On the membership map of the British Isles our loyal members on the Isle of Man and on Orkney were inadvertently omitted. There are 9 RIG members on the Isle of Man and 2 on Orkney.

FOR SALE

YU3UMV Framestore, cased with PSU, 9-inch B/W monitor, Dartcom Meteosat down-converter, 1-metre dish with feedhorn and Turnstile antenna. "300. Buyer to collect. JVL Quad Loop Yagi for Meteosat. £45. Buyer to collect. Also 1695 LNA kit £20 plus postage. Henley on Thames. 0491 576906

FOR SALE

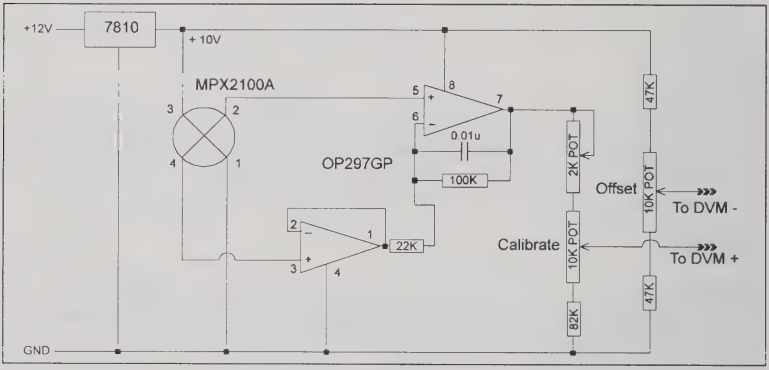
YU3UMV Framestore with A to D conversion range adapter, plus circuits and details. Also 12-inch B/W monitor. £180. John Willis, 20 Pemberton Gardens, Chadwell Heath, Romford, RM6 6SH. Tel. 081 590 5275

CRATER tubes of EEV manufacture. A very small quantity is available as spares for people with working systems. Contact Henry Neale for details.

A HOME-BREW DIGITAL BAROMETER

Mike Goodall

I have often wondered if there was an accurate alternative to the standard Aneroid barometer that most of us have in our homes. Most of these 'Present from Morecambe' types can be anything but precise, even if calibrated accurately at the mid- range. There are a few exceptions, such as the professional Short & Mason temperature-corrected types, one of which hangs on my wall, which can be accurate to around 1 millibar. I was recently sent a sample of the Motorola MPX2100A silicon pressure sensor, which can be built into a digital barometer. Digital barometers are available now to the general public but tend to be expensive, over £80.00. Motorola produce a range of pressure sensors, from 0-10KPa (100mb) to 0-200KPa (2,000mb). As we only need to go just over 1000mb (1,040mb is about the highest pressure we ever record in the UK) the MPX2100A (0-1000mb) is the best device. It has temperature compensation built in and is of the strain-gauge bridge design. A two-stage op-amp and a few components are all that are needed to give an output to a digital voltmeter on the 200mV range. A 3.5 digit display is the minimum requirement and will give a direct reading of "102.5" for a pressure of 1025mb. You could purchase a separate digital voltmeter module (most have a direct input of 200mV) but they tend to be expensive, around £25-£30. Complete digital voltmeters can be found so cheaply these days, from £5.00 upwards, and would be more than adequate for this job.



The circuit diagram supplied is a slight modification of the Motorola application notes, to allow finer calibration. The main problem with the circuit is temperature drift causing calibration to vary. If you use the old 741 op-amps, you could get considerable drift for a small change in temperature. The OP297GP dual op-amp was chosen for it's low noise and low temperature drift,

as well as being designed for strain-gauge and sensor applications. Doubtless there are other op-amps even better for the job. This one costs around £6.00. All the components in the circuit should have a low temperature drift per degree C. Metal film resistors are recommended, such as the 0.125W Radiospares types, that have a temperature coefficient of 50ppm. The only better types are their precision metal film resistors at 15ppm but they cost nearly a pound each. The two 10K and the 2K presets need to be 20-turn types, the R/S rectangular types being ideal. They all have a temperature coefficient of around 100ppm. The voltage regulator can be the standard tab type such as a 7810. If extreme temperature ranges are likely to be experienced a feedback type may be preferable. There are special strain-gauge bridge amplifier modules available but they are quite expensive, around £50.00, but would undoubtedly clear up any temperature drift problems.

There are two main ways of setting up the circuit. Put the sensor in a vacuum, adjust the offset pot till the display reads 0, then remove it and calibrate it with a known source using the calibration pot. In the unlikely event that you haven't a good vacuum chamber in your workshop, the second method may be appropriate. Measure your 10V supply to ground to within 0.1 volt and set the offset preset to give you exactly one half the supply voltage at the wiper of this preset (-V output to meter). Then set the 2K preset to half way and adjust the 10K calibrate preset to give you the correct mb reading on your multimeter against an accurate aneroid barometer. The 2K preset can then be used as a final trim. If you are not certain of your local pressure, your local weather station may be able to quote you an accurate reading over the phone. A simple temperature test should then be carried out. Hold a hairdrier about a foot away, switched to hot, for a few seconds. If the display varies (normally downward) by any great amount you have a temperature problem. Try a more accurate regulator and components. Incidentally 1000mb = 29.529 in. of mercury, should your barometer only have this scale. ●

Availability information:

The MPX2100A sensor should be obtainable from your Motorola agent (Timestep had a few of these; worth a telephone call).

The OP297GP is available from RS Components (ElectroMail), Pt No. 310-802.

No problems should be experienced sourcing the other components.

FOR SALE
286 motherboard, AMI BIOS, fitted with 4Mb memory. £45.
Paul Adamson 0243 376594

METEOR 3-5 COMES TO LIFE ONCE MORE

Geoff Perry MBE. The Kettering Group

Just as some people had decided that nothing further would be heard from Meteor 3-5, APT transmissions started up once again. I was `up country' in connection with the STS-61/HST service mission at the time and first became aware of the renaissance on returning to Bude on 1 December to discover a fax from Peter Wakelin, sent at 1039 on the previous day, which said, "One way to get a Meteor to switch on is to write in the RIG Journal that it is dead! After 13 months without imaging 3-5 came up with very good images yesterday on 137.30 MHz. On running out of daylight it switched to a 3 second cycle reminiscent of the 20 l/min of earlier Meteor 2s. ....." John Murray had phoned that evening but not left a message with my wife - he maintains that whenever I go away something interesting happens spacewise (the Chinese satellite recovery failed when we on vacation in Italy!).

So once again I had missed the excitement of an original observation and the subsequent analysis and identification. Moreover, in these times of PCs and sophisticated tracking software, fewer challenges present themselves - my daughter, who grew up in the slide-rule and graph paper ambience of the Cosmos 186/Soyuz 2 era, makes derogatory comments such as, "I don't call that tracking", when she sees me using InstantTrack or SMX.

Supposing that I did not have such modern wonders and had chanced on the 137.3 MHz signal at 1353 on 2 December when twiddling through the metsat band on our old Hallicrafters S27? As I do not produce images but merely listen to monitor the status of Russian metsats I would have assumed that I was receiving a transmission from Meteor 3-3, which I had last logged on that frequency at 1240 on 20 November. In twelve days it would come approximately 20 min later (158 x 109.48 - 12 x 1440 = 17.84 min) implying some time around 1300, or nearly an hour ago. By the time I would have done this the signal format would have changed at 1403:30 and I would have assumed that I was listening to a Meteor 2. I had last logged Meteor 2-21 on 137.85 MHz at 0905 on 3 November. In 29 days that would have come approximately 5½ hours later (404 x 104.18 - 29 x 1440 = 328.72 min) implying some time around 1435, or in about 40 minutes time. Clearly, neither Meteor 3-3 nor Meteor 2-21 could be the source of the transmissions.

With access to two-line element sets, laborious calculations would have enabled identification, but which satellites would one investigate? Better to wait and make further observations which would permit determination of the orbital period. The change of transmission format from visible to infra red, or vice versa, when Meteors cross the terminator (actually when the solar elevation at the sub-satellite point reaches a given value) is well known. Over a period of a

few days only, the latitude at which this occurs does not change appreciably and, as a first approximation, one may assume that these changes occur at the same point around the orbit. One can then proceed to determine the nodal period from three observations - on two consecutive passes on one day and on one pass on either the preceding or following day.

Changes from visible to infra red were logged on 3 December at 1156:40 and 1346:02. These put the nodal period at 109.37 min -obviously a Meteor 3 after all! An averaged value over the whole observation interval smooths out any errors in personal reaction time and reference clock (I use the LCD clock-display of my AR2001, which is set daily by tuning to Russian navigation satellite transmissions in the 149.91-150.03 MHz band - if one of the Russian navsats happens to be above the horizon at the time I use that in preference). The number of elapsed revolutions (which must be an integer) is found by dividing the total interval by the approximate nodal period; in this case 1422.533/109.37 = 13.007. Division of the interval by 13 gives a refined nodal period of 109.426 min. Although, in fact, this turns out to be a little high (further observations over the next few days produced a more consistent result of 109.41 min), it would have been accurate enough to label the source as Meteor 3-5 (the nodal period of Meteor 3-3 being 109.48 min and that of Meteor 3-4 being 109.44 min).

The educational value of such an exercise should not be overlooked[1]. Many schools have the equipment necessary for the production of imagery and the determination of a nodal period by this method requires only two or three observations in no more than a week. Then, by assuming a circular orbit, the mean height above the Earth's surface and mean velocity can be calculated using the formulae

$$h = 331.2732 \times T^{(2/3)} - R_E \quad \text{km}$$

$$v = 2\pi(R_E + h)/T \quad \text{km s}^{-1}$$

where the Earth's mean equatorial radius, $R_E = 6378.15$ km.

For Meteor 3-5 these give 1200 km and 7.25 km/s. It can be shown that a timing accuracy of no worse than ±2 seconds does not affect the accuracy of the nodal period determination to the second decimal place of a minute (0.06 sec).

Late addition: The method described for determination of nodal period is not valid when the ground track approaches coincidence with the line of the terminator. Switch-off times at 0930:22, 1101:28 and 1043:17 on 11,12 and 13 January respectively yield a "period" of 109.37 min but the latitude of switch-off was decreasing by approximately 2 degrees per day at those times. GEP ⊕

---

1 Perry, G E, "A simple satellite monitoring project", Proc AMSAT-UK Colloquium 1993, pp16-29.

OKEAN SATELLITES - THE LAST SECRET?
John Murray G4HLR

Firstly, let me re-assure all those who know me that this article really was written by me! For those, perhaps more fortunate, people who do not know me, let me say that I am not given to actually putting things down on paper very often. As an example, during my service in the RAF my mother sent me a stamped, self-addressed envelope and some writing paper, along with the appropriate comments. Two weeks later, when I had still not replied, I got a short note and an accompanying letter. The note asked me to put the accompanying letter into the s.s.a.e. I had already received. The letter was headed Dear Mum, and contained comments like, I hope all is well at home etc., and was signed your loving son, John! I think it says much about Peter Wakelin's tenacity, in that he would not let me get out of scaring the hell out of my wordprocessor. Right, that's the gossip for Henry's benefit, now the serious stuff.

I have been taking weather satellite images in one form or another since Meteosat 1 in 1979. In those early days using one of those "paranoid" cameras strapped to a Cossor 24T oscilloscope with the CRT being directly modulated by the audio signal. In the early 1980s more suitable technology in the shape of the YU3UMV frame store was used, (and still is too!). This coincided with the halcyon days of the then Soviet Union's satellite programme. I became heavily involved in researching the Cosmos and Okean satellite programmes. Unfortunately, work seriously interfered with this research, (it still does!), and the Russians would not co-operate by arranging the orbits to suit my non-work schedule. The solution was simple, tape-record all the orbits. So, one series 7 Ferrograph 10" reel-to-reel tape-recorder later, we were in business. Note: get someone else to carry the Ferrograph! They have also been known to write-off the tailgates of Volvo Estate cars, as G6ZOJ will testify.

Snag: a 10 inch reel of tape holds about **eight hours** of data and, being serial data, it takes eight hours to go through it! Solution; buy more tapes and change them on a daily basis for a new one and simply view them all later at leisure. Ha! the man's an idiot I hear you say, - correct! Between G6ZOJ and myself we now have some four year's worth of, as yet, unscreened weather satellite data! So, what's the point of the article? Well, I was scanning through some of this lot using the computer and Timestep software to extract any interesting images from the Okeans and their precursors (Cosmos 1500, 1602, 1766 and 1869) to archive onto floppy disk, when I happened to make the following discovery.

These satellites were very versatile and disseminated not only visible images but also infra red and synthetic aperture radar (SAR), as well as "microwave-sounder" images. I am well aware that many RIG members have

not seen some of these images and have provided copies for Peter if he has space to include them. These images took a variety of transmitted forms. SAR, for example, was often transmitted at night and only over the Baltic/Gulf of Bothnia area. These images were accompanied by a telemetry coding which became

known as "piano-keys" because it resembled the black and white keyboard of that instrument. Images that were purely visible, or a mix of visible/infra-red or, very rarely, visible/IR/SAR were accompanied by a number sequence telemetry. These numbers caused quite an interest at the time and much communication took place with Geoff Perry regarding them. Geoff eventually, through the Kettering Group, was able to provide not only a solution to these numbers but also a short BASIC programme listing to decode them. See RIG 10, page 14.

So, what's new? Well, a number of images were transmitted that had a blank, apparently totally black, section where the SAR would normally be. This was deemed to be normal as the radar was rather power consuming and, usually, only operated for 6 minutes and 20 seconds on each pass, (the maximum possible run time for this radar being 8 minutes), before being switched off

TELEM.
VISIBLE IMAGE
"BLANK"
MICROWAVE SOUNDER
PROCESSED "BLANK"
HAMBURG
BUDAPEST
BERLIN
VIENNA

NOAA 9 PERIOD 101.92 MINS FREQUENCY 137.62MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

12/03	08.44	20.17	14/04	10.03	19.54	17/05	09.39	19.30
13/03	08.31	20.04	15/04	09.50	19.41	18/05	09.26	19.17
14/03	10.00	19.51	16/04	09.37	19.28	19/05	09.13	19.04
15/03	09.47	19.38	17/04	09.24	19.14	20/05	09.00	20.33
16/03	09.34	19.25	18/04	09.11	19.01	21/05	08.47	20.20
17/03	09.21	19.12	19/04	08.58	20.30	22/05	08.34	20.07
18/03	09.08	18.59	20/04	08.44	20.17	23/05	10.03	19.54
19/03	08.55	20.27	21/04	08.31	20.04	24/05	09.50	19.41
20/03	08.42	20.14	22/04	10.00	19.51	25/05	09.37	19.28
21/03	08.29	20.01	23/04	09.47	19.38	26/05	09.24	19.14
22/03	09.57	19.48	24/04	09.34	19.25	27/05	09.11	19.01
23/03	09.44	19.35	25/04	09.21	19.12	28/05	08.58	20.30
24/03	09.31	19.22	26/04	09.08	18.59	29/05	08.44	20.17
25/03	09.18	19.09	27/04	08.55	20.28	30/05	08.31	20.04
26/03	09.05	18.56	28/04	08.42	20.15	31/05	10.00	19.51
27/03	08.52	20.25	29/04	08.29	20.02	01/06	09.47	19.38
28/03	08.39	20.12	30/04	09.58	19.48	02/06	09.34	19.25
29/03	08.26	19.59	01/05	09.45	19.35	03/06	09.21	19.12
30/03	09.55	19.46	02/05	09.32	19.22	04/06	09.08	18.59
31/03	09.42	19.33	03/05	09.18	19.09	05/06	08.55	20.28
01/04	09.29	19.20	04/05	09.05	18.56	06/06	08.42	20.14
02/04	09.16	19.07	05/05	08.52	20.25	07/06	10.11	20.01
03/04	09.03	18.53	06/05	08.39	20.12	08/06	09.58	19.48
04/04	08.50	20.22	07/05	10.08	19.59	09/06	09.45	19.35
05/04	08.37	20.09	08/05	09.55	19.46	10/06	09.31	19.22
06/04	08.24	19.56	09/05	09.42	19.33	11/06	09.18	19.09
07/04	09.52	19.43	10/05	09.29	19.20	12/06	09.05	20.38
08/04	09.39	19.30	11/05	09.16	19.07	13/06	08.52	20.25
09/04	09.26	19.17	12/05	09.03	20.35	14/06	08.39	20.12
10/04	09.13	19.04	13/05	08.50	20.22	15/06	10.08	19.59
11/04	09.00	18.51	14/05	08.37	20.09	16/06	09.55	19.46
12/04	08.47	20.20	15/05	10.06	19.56	17/06	09.42	19.33
13/04	08.34	20.07	16/05	09.52	19.43	18/06	09.29	19.20

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

12/03	06.31	17.58	14/04	06.37	16.23	17/05	06.43	16.29
13/03	06.07	17.34	15/04	06.13	17.40	18/05	06.19	17.46
14/03	07.24	17.10	16/04	05.49	17.16	19/05	05.55	17.22
15/03	06.59	16.45	17/04	07.05	16.52	20/05	07.11	16.58
16/03	06.35	16.21	18/04	06.41	16.27	21/05	06.47	16.33
17/03	06.11	17.38	19/04	06.17	17.44	22/05	06.23	17.50
18/03	07.27	17.14	20/04	05.52	17.20	23/05	05.58	17.26
19/03	07.03	16.49	21/04	07.09	16.55	24/05	07.15	17.01
20/03	06.39	16.25	22/04	06.45	16.31	25/05	06.51	16.37
21/03	06.15	17.42	23/04	06.21	17.48	26/05	06.27	17.54
22/03	05.50	17.17	24/04	05.56	17.23	27/05	06.02	17.29
23/03	07.07	16.53	25/04	07.13	16.59	28/05	07.19	17.05
24/03	06.43	16.29	26/04	06.49	16.35	29/05	06.55	16.41
25/03	06.18	17.46	27/04	06.24	17.52	30/05	06.30	16.16
26/03	05.54	17.21	28/04	06.00	17.27	31/05	06.06	17.33
27/03	07.11	16.57	29/04	07.17	17.03	01/06	07.23	17.09
28/03	06.46	16.33	30/04	06.53	16.39	02/06	06.58	16.45
29/03	06.22	17.49	01/05	06.28	17.55	03/06	06.34	16.20
30/03	05.58	17.25	02/05	06.04	17.31	04/06	06.10	17.37
31/03	07.15	17.01	03/05	07.21	17.07	05/06	05.45	17.13
01/04	06.50	16.36	04/05	06.56	16.42	06/06	07.02	16.48
02/04	06.26	17.53	05/05	06.32	16.18	07/06	06.38	16.24
03/04	06.02	17.29	06/05	06.08	17.35	08/06	06.14	17.41
04/04	07.18	17.04	07/05	07.24	17.11	09/06	05.49	17.16
05/04	06.54	16.40	08/05	07.00	16.46	10/06	07.06	16.52
06/04	06.30	17.57	09/05	06.36	16.22	11/06	06.42	16.28
07/04	06.05	17.33	10/05	06.11	17.39	12/06	06.17	17.45
08/04	07.22	17.08	11/05	05.47	17.14	13/06	05.53	17.20
09/04	06.58	16.44	12/05	07.04	16.50	14/06	07.10	16.56
10/04	06.34	16.20	13/05	06.40	16.26	15/06	06.45	16.31
11/04	06.09	17.36	14/05	06.15	17.42	16/06	06.21	17.48
12/04	07.26	17.12	15/05	05.51	17.18	17/06	05.57	17.24
13/04	07.02	16.48	16/05	07.08	16.54	18/06	07.14	17.00

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

12/03	05.18	15.09	14/04	05.15	15.06	17/05	05.13	15.04
13/03	05.05	14.56	15/04	05.03	14.54	18/05	05.01	14.52
14/03	04.53	14.44	16/04	04.51	16.24	19/05	04.48	16.21
15/03	04.40	16.13	17/04	04.38	16.11	20/05	04.36	16.09
16/03	04.28	16.01	18/04	04.26	15.59	21/05	06.05	15.56
17/03	04.15	15.48	19/04	05.55	15.46	22/05	05.53	15.44
18/03	05.45	15.36	20/04	05.43	15.34	23/05	05.40	15.31
19/03	05.33	15.24	21/04	05.30	15.21	24/05	05.28	15.19
20/03	05.20	15.11	22/04	05.18	15.09	25/05	05.16	15.07
21/03	05.08	14.59	23/04	05.06	14.57	26/05	05.03	14.54
22/03	04.55	14.46	24/04	04.53	16.26	27/05	04.51	16.24
23/03	04.43	16.16	25/04	04.41	16.14	28/05	04.38	16.11
24/03	04.30	16.03	26/04	04.28	16.01	29/05	04.26	15.59
25/03	04.18	15.51	27/04	05.58	15.49	30/05	05.55	15.46
26/03	05.48	15.39	28/04	05.45	15.36	31/05	05.43	15.34
27/03	05.35	15.26	29/04	05.33	15.24	01/06	05.30	15.21
28/03	05.23	15.14	30/04	05.20	15.11	02/06	05.18	15.09
29/03	05.10	15.01	01/05	05.08	14.59	03/06	05.06	14.57
30/03	04.58	14.49	02/05	04.56	16.29	04/06	04.53	16.26
31/03	04.45	16.18	03/05	04.43	16.16	05/06	04.41	16.14
01/04	04.33	16.06	04/05	04.31	16.04	06/06	04.28	16.01
02/04	04.21	15.54	05/05	06.00	15.51	07/06	05.58	15.49
03/04	05.50	15.41	06/05	05.48	15.39	08/06	05.45	15.36
04/04	05.38	15.29	07/05	05.35	15.26	09/06	05.33	15.24
05/04	05.25	15.16	08/05	05.23	15.14	10/06	05.20	15.11
06/04	05.13	15.04	09/05	05.11	15.02	11/06	05.08	14.59
07/04	05.00	14.51	10/05	04.58	14.49	12/06	04.56	16.29
08/04	04.48	16.21	11/05	04.46	16.19	13/06	04.43	16.16
09/04	04.36	16.09	12/05	04.33	16.06	14/06	04.31	16.04
10/04	04.23	15.56	13/05	06.03	15.54	15/06	06.00	15.51
11/04	05.53	15.44	14/05	05.50	15.41	16/06	05.48	15.39
12/04	05.40	15.31	15/05	05.38	15.29	17/06	05.35	15.26
13/04	05.28	15.19	16/05	05.25	15.16	18/06	05.23	15.14

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

12/03	08.25	18.12	14/04	08.13	18.00	17/05	08.00	17.48
13/03	08.03	17.50	15/04	07.51	17.38	18/05	07.39	19.07
14/03	07.41	19.09	16/04	07.29	18.57	19/05	07.17	18.45
15/03	07.19	18.48	17/04	07.07	18.36	20/05	08.36	18.23
16/03	08.39	18.26	18/04	08.27	18.14	21/05	08.14	18.01
17/03	08.17	18.04	19/04	08.05	17.52	22/05	07.52	17.40
18/03	07.55	17.42	20/04	07.43	19.11	23/05	07.31	18.59
19/03	07.33	19.01	21/04	07.21	18.49	24/05	07.09	18.37
20/03	07.11	18.40	22/04	08.40	18.28	25/05	08.28	18.15
21/03	08.31	18.18	23/04	08.19	18.06	26/05	08.06	17.53
22/03	08.09	17.56	24/04	07.57	17.44	27/05	07.44	17.31
23/03	07.47	17.34	25/04	07.35	19.03	28/05	07.23	18.51
24/03	07.25	18.53	26/04	07.13	18.41	29/05	07.01	18.29
25/03	07.03	18.32	27/04	08.32	18.20	30/05	08.20	18.07
26/03	08.23	18.10	28/04	08.11	17.58	31/05	07.58	17.45
27/03	08.01	17.48	29/04	07.49	17.36	01/06	07.36	19.05
28/03	07.39	19.07	30/04	07.27	18.55	02/06	07.14	18.43
29/03	07.17	18.46	01/05	07.05	18.33	03/06	08.34	18.21
30/03	08.37	18.24	02/05	08.24	18.12	04/06	08.12	17.59
31/03	08.15	18.02	03/05	08.03	17.50	05/06	07.50	17.37
01/04	07.53	17.40	04/05	07.41	19.09	06/06	07.28	18.57
02/04	07.31	18.59	05/05	07.19	18.47	07/06	07.06	18.35
03/04	07.09	18.38	06/05	08.38	18.25	08/06	08.26	18.13
04/04	08.29	18.16	07/05	08.16	18.04	09/06	08.04	17.51
05/04	08.07	17.54	08/05	07.55	17.42	10/06	07.42	19.11
06/04	07.45	17.32	09/05	07.33	19.01	11/06	07.20	18.49
07/04	07.23	18.51	10/05	07.11	18.39	12/06	06.58	18.27
08/04	07.01	18.30	11/05	08.30	18.17	13/06	08.18	18.05
09/04	08.21	18.08	12/05	08.08	17.56	14/06	07.56	17.43
10/04	07.59	17.46	13/05	07.47	17.34	15/06	07.34	19.03
11/04	07.37	19.05	14/05	07.25	18.53	16/06	07.12	18.41
12/04	07.15	18.43	15/05	07.03	18.31	17/06	08.32	18.19
13/04	08.35	18.22	16/05	08.22	18.09	18/06	08.10	17.57

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

leaving this "blank" section. I had therefore assumed that those images I had received with this blank section had the SAR switched off prior to my acquiring the signal.

Tapes for June 1991 were being examined when I came upon an image transmitted by Okean 3 on 17 June 1991. On the left, next to the telemetry numbers, is the visible image, then the "blank" section and finally the microwave-sounder image. The satellite was northbound with a ground track from approximately Belgrade to Riga but imaging is carried out from the left side of the spacecraft so the area imaged extends from the northern Adriatic to the southern Baltic Sea. Having decided to print a hard-copy for referencing the tape contents I accessed my usual "frame-grabber-cum-print" programme. To get best quality print I histogrammed the image prior to making any contrast/brightness adjustments and was greatly surprised to find data in the "blank" sector! Further processing revealed a recognisable image. At this point I compared the very "raw" image with SAR images from several different types of satellite and became convinced that it is not SAR imagery - or at least, not in any form that has been seen and reported so far.

Adrian (G6ZOJ), examined the image and was as surprised as I had been. He also felt that it was unlikely to be a SAR image. Geoff Perry was informed and in due course given sight of the images. At this stage, no information has been received as to the imaging device used. A quick check with similar images, i.e. those with "blank" sections, was made but, interestingly, not all contain these images; some really are blank.

We have yet to examine all the Okean/Cosmos series images in our possession to establish if this is exclusive to Okean 3, or has been there since the beginning on such birds as Cosmos 1500, 1602 etc. I would be interested to hear from any RIG member who finds such an image on any satellite other than Okean 3.

P.S. For those who are curious, yes I did send the letter to my Mum but I photocopied it first!

Editor's Note:

Some technical information on Cosmos 1500 was presented at the 35th Congress of the International Astronautics Federation held at Lausanne, Switzerland from 7-13 October, 1984 in a paper by Yu. A. Afans'ev et al. This was reported on pages 417-418 of Soviet Space Programs: 1981-87 Part 2, US Government Printing Office, Washington 1989. The following extracts may be of interest to readers as they help to explain why the radar and visible images do not cover the same areas. The side-looking radar operates at a wavelength of 3.15cm providing 1.52

Km resolution over a viewing field of 460Km. An improved multichannel low-resolution scanner provides imagery in four bands in the visible and near infra-red part of the spectrum: 0.5-0.6; 0.6-0.7; 0.7-0.8; 0.8-1.1 microns. The viewing field from the satellite's height of 650Km is 1,930Km with a ground resolution of 1.5Km. Up to 6.5 minutes of data can be recorded for subsequent transmission when within range of receiving stations. ●

PRODUCT NEWS

METEOSAT IMAGERY ON CD-ROM

A daily catalogue of Meteosat images spanning a period of several years is available on CD-ROM. If you can be patient RIG is arranging to purchase a quantity and make them available to members for payment in Sterling. They will also be available at the Royal Grammar School, Guildford on 30 April at their Remote Sensing Conference. Price about £10. Also available for 20 DM from J Le Ber, H/Meteosat Data Service, Meteosat Exploitation Project, European Space Agency, Robert Bosche Str. 5, D64293, DARMSTADT, Germany.

LANDSAT IMAGERY

The 30m resolution imagery from these satellites shows roads, roundabouts, large buildings, crop types, rural development patterns and even ships. Timestep now offer data for the whole of England and Wales but it is encrypted and can be read only with their software. It requires a 24-bit video card. All 6 bands of a 30Km square of your choice plus Multispectral View II processor for around £150 for RIG members. Contact Timestep for a colour brochure.

AMIGASAT V3.1

This new version from Martelec offers advanced image animation and automated reception for hands-free operation. It also provides extensive image processing facilities including a comprehensive digital filtering system, all under mouse control. Animation does not require the use of a hard disk. The number of frames available is limited only by the memory available. Amigasat V3.1 runs on all Amiga computers, including the new A1200 and A4000 machines and, being multitasking, other applications may be runing at the same time as Amigasat. Contact Martelec for further information.

COLOUR ANIMATION

Timestep's Meteosat colour animation programme offers up to 1000 frames with files now in Windows .BMP format. It uses the same algorithms as their PDUS

animation and the monochrome option offers 64 greys. There is real time dynamic pan and zoom. Currently supported video cards are Tseng ET3000/4000, OAK 512K, Trident 8900, Paradise/WD 512K and S3. £88 for RIG members. Contact Timestep for further information.

A NEW JVFAX INTERFACE UNIT

This unit from Martelec is designed to produce high quality pictures from JVFAX regardless of whether they originated from APT or FAX. Main features: Tailored hi and lo pass filters to maximise s/n ratio, Doppler shift compensation can be switched in or out by JVFAX programme, narrow band pass filter for FAX, remote control of all APT and FAX modes selectable by JVFAX. An interface is is also provided to remotely control satellite receivers such as Martelec's MSR40. Special introductory price £60 plus VAT. Further information from Martelec. ●

METEOSAT NEWS NOTES
John Tellick

METEOSAT 3 operational at 75W. Insufficient fuel for inclination correction so now has significant north/south daily oscillation.

METEOSAT 4 replaced by METEOSAT 5 as operational satellite at 0W from 4 February with data 30 minutes older. This time delay should be reduced when new software is introduced. Monitor Meteosat admin messages for updates.

METEOSAT 6 has slight anomaly on IR channels which is under investigation.

THE COLOUR PICTURES

Front cover: This model of a Meteor 3 was photographed at the Paris Air Show in 1993 by Geoff Perry. The transparency was printed by Peter Wakelin and then scanned, processed and finally "orbited" by Michael Gill.

Inside front cover: Les Currington at work in his "shack". See his article in this issue. Photographed by Patrick Ward.

Back cover and inside back cover: Cosmos 1500 photographed by Geoff Perry at the Paris Air Show in 1985. See John Murray's article in this issue.

We are grateful to the photographers for their permission to use these pictures.

ARCHIVING WXSAT IMAGES ON THE PC

Les Hamilton

In a previous article under this title (RIG 33, pp 27-30), Mike Goodall covered the archiving of weather satellite images in GIF format. He used NEOPAINT as the preferred software for cropping and otherwise enhancing images prior to archiving them as GIF files.

While the GIF format gives excellent compression for images with few colours, it gives very limited compression for 256-colour images. For example, a 512Kb DAT file (800 x 600) from PROsat II converted to a 388Kb GIF image is still 76% of its original size. By converting the same image to JPEG format, you can easily reduce the filesize to 90Kb, a reduction to just 18% of the original!

The JPEG file interchange format was established in 1991 by the Joint Photographic Experts' Group and was designed to give high compression ratios for continuous tone images of photographic quality. Clearly, wxsat 256-greyscale images fall into this category. Moreover, the signs are that, in just a few years' time, JPEG will replace GIF as the standard format for the transmission of compressed images.

JPEG compression is described as "lossy", which simply means that all the original image information is not recovered when the images are de-compressed. The algorithm used in compressing images exploits known limitations of the human eye, which is much more adept at perceiving small variations of light and dark than small colour details. The key factor is the "quality" setting, which can generally be varied from 95 down to 20. The lower the "quality" setting, the smaller the resulting compressed file. While it is obvious that setting too low will result in noticeable degradation of an image, it must be stressed that the "quality" setting is not "percentised" and settings as low as 40 or 50 may show no discernible loss of quality in some images.

As JPEG viewers take much longer to load images than their GIF equivalents you may prefer the latter for quick viewing and "slide-shows". For archiving a large number of images the JPEG format could be used to save greatly on space provided that a small loss of data on decompression is acceptable. Some programs also have powerful image enhancement features and they can be used solely for GIF image manipulation if desired.

A number of excellent shareware programmes which handle the JPEG format are now available. They include JPEG4386, LVIEW, WINJPEG and COLORVIEW which are reviewed in Shareware Corner in this issue. ●

SLOW-SCAN INFRA-RED IMAGERY FROM METEOR 3-5

Les Hamilton

Meteor 3-5 awoke from a year-long period of inactivity in late November 1993. It transmitted good, visible light images during the day and, surprisingly, 20 line/minute infra-red transmissions during the evenings.

Earlier IR images from this satellite were of the usual 120 line/minute rate and, as far as I am aware, this was the first occurrence of slow-scan imagery from a series-3 Meteor. I wrote a short note in RIG 24 (page 87) on Meteor 2-16's slow-scan imaging, noting that this mode always seems to be transmitted in the final quarter of a year, specifically in November and December. This was the case in 1989, 1990 and, yet again, in 1993.

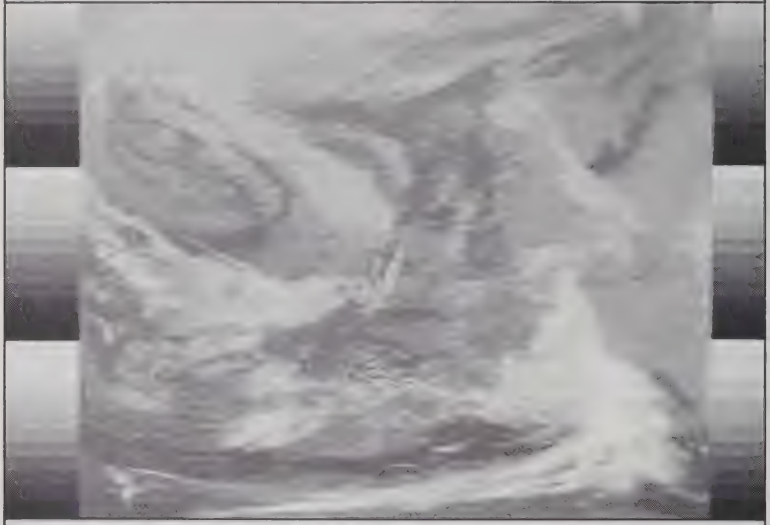
I first captured a transmission on November 30 at 2015Z, then again at 2205 and 2355. As I was unable to decode the signals at the time I recorded them on tape and pondered what to do next. Since PROsat II does not offer an option to decode this format I returned to the Archimedes, equipped with Spacetech's framestore. This allows the user to customise "setup" files to decode almost any satellite signal.

The signal contains a toneburst consisting of 96 phasing bars and produces image lines of 7200 pixels horizontally. However, since I don't have a monitor that wide, the lines were mapped to a picture width of 512 pixels. As the scan rate is low, a pass rarely exceeds 300 lines but despite this low along-track resolution the results are surprisingly good. The accompanying images are typical and are much better than those from the series-2 Meteors. Unlike other Meteor images, these are flanked by grey-scale bands reminiscent of NOAA images but much wider. Images are transmitted with cold surfaces showing white and warm ones dark, which is the reverse of the more usual Russian IR transmissions.

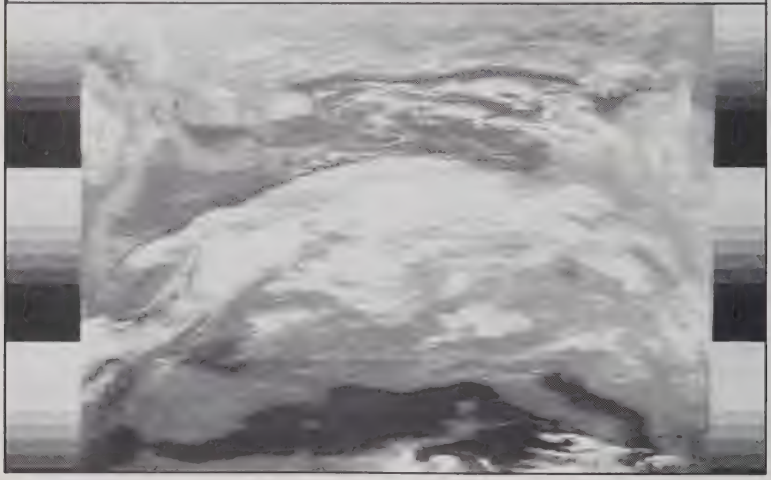
An interesting feature of the transmission, which I initially took to be interference, was a two line break that appeared in every image. However, careful investigation of some of the transmissions where this happened twice showed that it always occurred after a set of 198 image lines. In other words, every ten minutes two lines are used for purposes other than to transmit image lines (perhaps telemetry?). I have removed these lines from the accompanying images but their location is generally fairly obvious because the contrast shows a distinct change.

On December 8 things started to go awry. The first evening pass contained the grey-scales but no image yet the subsequent pass seemed alright. From December 10-14 the images were absent and from December 15 the slow-scan

METEOR 3-5 SLOW-SCAN IR 30 NOVEMBER 1993



METEOR 3 - 5 SLOW-SCAN IR 3 DECEMBER 1993



imager was switched off.

Although Meteor 3-5's slow-scan IR imaging was short-lived, I did manage to decode about a dozen of its transmissions which I have converted to GIF files. [They are available from the RIG GIF library on disk 127. Ed] ●

THE ARCHIMEDES IMAGE LIBRARY

In view of the very small number of members using this service, its future is under review. More information will appear in the next Journal but, meanwhile, the image disks 1-34 listed in RIG34 are still available for the Archimedes.

Here is how to obtain your Archimedes images:

The same rules apply as for the Shareware Library.

Please send only 800Kb 'E' formatted DS/DD disks.
(All Archimedes machines can format to 800Kb on DS/DD disks)

Note that disks 26, 27 and 30 will require two 800Kb disks each to hold all the converted files. ●

BULLETIN BOARDS

Orbital elements and other information of use to members are available from several electronic bulletin boards. The three listed below all offer free service and are available 24 hours a day. In addition to orbital elements (in both Amsat and NASA 2-line formats), the RIG and Timestep services include regularly updated weather satellite status reports indicating which ones are transmitting and their frequencies. The RIG board also offers a range of shareware programmes.

Telephone numbers:	RIG BBS	0945 85666
	Timestep BBS	0440 820002
	Dartcom BBS	0822 88249

In each case the protocol is the normal 8 bit, no parity, 1 stop bit. ●

WANTED

Circuit diagram or an offer of repair for a Philips PM 3110 oscilloscope.
Contact Mark Pepper on 0344 777730 evenings.

QUESTIONS & ANSWERS

Q. I am considering purchasing PDUS equipment but am not prepared to pay a large sum to decrypt the data. Will it be expensive?

A. No firm decisions have been taken yet but there are grounds for cautious optimism. £20-40 per annum has been suggested as a likely license fee for educational and amateur users. The UK delegation to the recent EUMETSAT working group argued that a LIMITED set of high resolution data should not be encrypted but there is opposition to this from other countries. The next meeting of the EUMETSAT governing body takes place in June and important decisions are likely to be made then.

Q. Why do northbound NOAA satellites pass to the left of the North Pole and Meteors pass to the right?

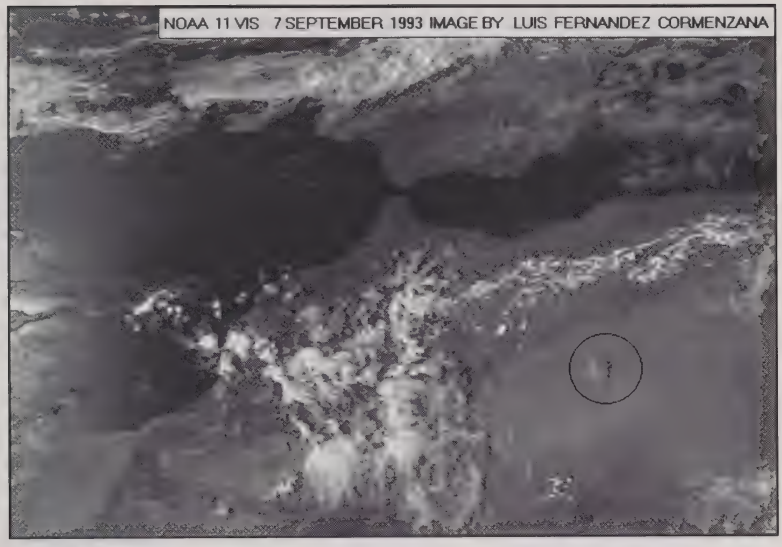
A. It is all due to the equatorial bulge of the Earth caused by its rotation. Except when a satellite passes exactly over the poles the gravitational attraction of the two halves of the Earth on either side of its orbital plane are not precisely equal. The effect of this is to cause the plane of the orbit to change slightly with time, or precess. When a satellite is launched towards the east (and most are to take advantage of the speed of rotation of the launch site) this precession pulls the plane of the orbit westwards. It takes more energy to launch a satellite westwards as the Earth's rotational speed has to be overcome but the advantage is that precession then pulls the orbital plane eastwards. If the launch inclination is chosen carefully then this precession can exactly offset the effect of the Earth's orbital motion around the Sun. The result is termed a sun-synchronous orbit which has the property that a point on the surface of the Earth passes through the plane of the orbit at the same time every day. This is a popular orbit for weather and other Earth observation satellites both civilian and military but the Russians have made little use of it.

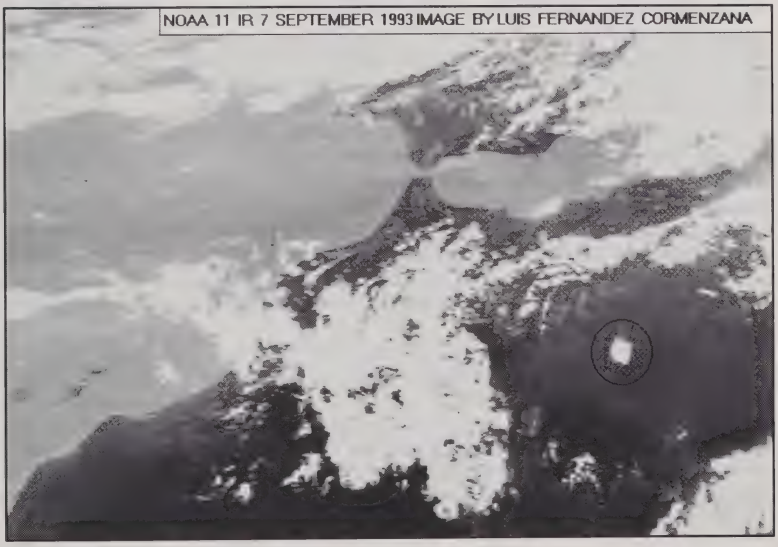
Q. What does Feng Yun mean?

A. Wind and Cloud.

Q. I don't understand the Meteosat admin messages which say something like "The Spring Eclipse Period is in Progress and Slots 1, 2, 47 and 48 will not be taken" What is eclipsing what and what are "Slots"?

A. Meteosat and all other geostationary satellites orbit the Earth once a day in an orbit that keeps them over the equator. At the distance of Meteosat (35,800Km)


NOAA 11 VIS 7 SEPTEMBER 1993 IMAGE BY LUIS FERNANDEZ CORMENZANA


NOAA 11 IR 7 SEPTEMBER 1993 IMAGE BY LUIS FERNANDEZ CORMENZANA

the Earth appears as a globe with a radius of about 9 degrees. When it is midnight at the point on the ground directly below the satellite an observer on the satellite would see the Sun pass either above the Earth, behind it, or below it depending on the time of year. As the Earth's equatorial plane is inclined at 23.4 degrees to its orbit it follows that viewed from Meteosat the Sun will pass above or below the Earth by up to this amount so for most of the year the satellite will remain sunlit at midnight and its solar cells will continue to generate power. However, for about three weeks on either side of the equinoxes, when the Sun is within 9 degrees of the equator, it will pass behind the Earth at midnight and solar power cannot be generated so many of the satellite's systems are switched off. Larger batteries would not solve the problem as the imager would still have to be turned off to avoid damage as the Sun neared the Earth's limb.

Meteosat's scanner images the Earth every 30 minutes so there are up to 48 scans or "Slots" in a day. It is nothing more than a time reference avoiding halves so just divide the slot number by two to get the time. The admin message could have read "...the scans from 2330 to 0100 inclusive will not be taken"

Q. Would it be possible to provide an index to all the back-issues of the Journal?

A. This is a major task which Michael Gill is currently undertaking. We hope to have the finished product later this year. Whether it will be published in the Journal or made available separately has yet to be decided.

Q. The accompanying image shows a strange phenomenon. The object in the Sahara desert is cold compared with the ground but it is not bright like a cloud. Is it a desert storm?

A. Luis Fernandez Cormenzana captured this remarkable image from Benidorm last September and indeed it does show a massive sandstorm (encircled on the image). From the IR image alone it appears very much like the top of a cumulonimbus cloud but such a cloud would appear very bright on the vis image whereas fine sand particles are much less reflective. The dust cloud is high enough to cast a conspicuous shadow, possibly as much as 15Km high and appears to be about 80Km in diameter. That's a lot of sand! ●

1994 RENEWALS - COMMENTS

Ray Godden

"Superb", "Brilliant", "Fantastic" - these are some of the comments which you have sent to us on the Activity Survey form. Of course not all remarks were as congratulatory but overall the feedback indicates that most of our members are highly satisfied with RIG and this Journal. More than 400 comments have

already been received and analysis will take time, however since the purpose was to guide future policy rather than to enlarge the heads of the committee some conclusions can be drawn now. I will use comments verbatim as illustrations.

"Superb Journal but let's have more for the 'technically unqualified'." ".. one of the few I read and re-read from cover to cover." "More constructional articles with PCBs and parts as kits." "I look forward to more DIY projects." "A very well balanced read .. Great pictures." "Please don't get too lavish with publications." ".. No. 35 is printed not very well .. I liked the older better." (There was a problem with the last issue, not connected with the type of paper, for which we have been compensated by the printers.) ".. excellent, in content, style and illustrations." "A relatively new member of RIG. The Journal is superb - very professional and a wealth of information." ".. less Timestep bias and a wider definition of 'Remote Imaging'." "Keep the balance of technical/operating/info articles much as RIG 35." ".. I enjoy reading it too! (from her indoors)." "Interpreting Weather Satellite Imagery - Excellent series." "Please keep pushing against encryption - we should not be paying twice for this information." "I do support all those fighting for free access to EUMETSAT imagery corresponding to the free circulation of information accepted by the European Community."

The great majority of members appear to appreciate the improvements that have been made in the presentation of the Journal and regard it as good value. A few are concerned about the cost and would prefer a more modest publication. There is a demand for more guidance for beginners although it is recognised that we have already made efforts here. We are sometimes reminded that not all members are radio amateurs and/or computer buffs! Many are keen on home-brew and would like more constructional articles and for RIG to provide PCBs and kits. There is concern about encryption and support for RIG's efforts in lobbying agencies for our interests. One more intriguing quote - .. Many readers from abroad may have problems with sentences like: 'Now there's minimalist doctrine for you' (RIG 35 p19). Leave it in, but perhaps explain/educate a little. Well, I am not sure that RIG's purpose is educational to that extent but writers could bear in mind that the proportion of non-anglophone readers is significant and growing.

The very many expressions of appreciation encourage us and justify all the hours of work that it takes to run 'RIG'. We are grateful to those who added donations to their subscriptions; we will use them to benefit members. The suggestions (and criticisms) that have been made will help us to shape the future development of the Group. The Committee thank you all for the enthusiasm with which you responded to us. ●

RIG GIF LIBRARY

PETER WAKELIN

The new procedure for obtaining disks introduced in December is working well. Now that images are supplied only on 1.44 Mb disks I have been able to re-arrange the files to fill the disks to capacity. After deleting a few of the poorer quality images and cropping one or two others I ended up with 20 disks.

The changes have necessitated a new numbering system to avoid confusion. A revised index of disks currently available follows. Where a significant number of images are from earlier disks the former disk numbers are given in []. The number of images on each disk is given in ().

Disk 100 has been compiled for those of you who are unfamiliar with computer images from the GIF library and, perhaps, unsure of DOS commands. It contains 8 images selected from other disks together with VPIC and PKUNZIP. Simple-to-follow instructions in plain English are included to get you up and running.

Considerable interest has been shown in HRPT imagery so I have made up 4 disks from my own archives. The files are larger, with images up to 1024x768, so there are only about 4 images per disk. Disk 127 holds slow-scan IR images recently received from Meteor 3-5 by Les Hamilton.

Additional good quality images are always welcomed for the library. Our members outside Europe are especially invited to send images of their parts of the world. A short text accompanying the images would be appreciated. I would like to make up a disk of images from the short-lived NOAA 13 satellite. I have several of Central and Western Europe but would be grateful for some from further afield. Please send images to me at the address below.

HERE'S HOW TO OBTAIN YOUR DISKS

UK Members: Cheque or postal order made payable to Remote Imaging Group and sent to Peter Wakelin, 1 Charters Road, ASCOT, Berkshire, SL5 9QF. There is no credit card service for members in the UK.

Other Members: Bank Draft (in Sterling and drawn on a UK London-based bank) or Eurocheque made payable to Remote Imaging Group and sent to Peter Wakelin at the above address. Overseas members may prefer to pay by credit card in which case orders (which will be subject to a 3% surcharge) should be

sent BY MAIL to Mark Clarke, 9 Park Lane, Bulmer Tye, SUDBURY, Suffolk, CO10 7EQ, UK.

GIF LIBRARY INDEX

100	VPIC viewing programme with PKUNZIP + 8 images selected from other disks. Starter-pack with simple-to-follow instructions.	
101	APT. Mostly NOAA. Some colour. [1,2] (9)	Mainly M Goodall
102	Americas. Mostly HRPT. [3,4] (14)	
103	Americas. HRPT. [4,5] (10)	
104	Space Shuttle, Planets. [6] (9)	
105	Miscellaneous. [7,8] (10)	
106	North America. HRPT, Meteor. [9,10] (7)	
107	Europe. HRPT. [13,18,19] (11)	Marciano Righini
108	Europe, Greenland. HRPT. [15,20] (9)	Peter Hayes
109	Europe. HRPT. [21,34] (11)	P Hayes/M Righini
110	Mainly PDUS. [25,34] (6)	J Brown/M Righini
111	Feng Yun. [17,22] (5)	
112	Okean. [28,32] (14)	Mainly L Hamilton
113	North America. HRPT. [22] (7)	Tom Loebl
114	Australia, Pacific. [14,31] (7)	Mainly M Delahunty
115	Mainly N & E Europe. Meteor. [26,27] (17)	Ulf Jander
116	Europe, Greenland. Meteor. [8,30] (9)	R Whitby/G Shipton
117	Greenland. Meteor. (4)	
118	Shuttle, Mars. [23] (4)	
119	Various including Arabia APT. [9,24] (5)	
120	Jupiter, Saturn and their moons. (10)	
121	Europe. Multispectral. [29,33] (10)	D Cawley/C Roberts
122	Iceland, Greenland. HRPT. (5)	P Wakelin
123	Europe. HRPT. (3)	P Wakelin
124	Europe. HRPT. (4)	P Wakelin
125	Europe. HRPT. (4)	P Wakelin
126	Europe. Multispectral. (7)	Trevor Smithers
127	Slow-scan IR. Meteor 3-5. (15)	L Hamilton

NEXT RIG CONFERENCE

Your committee has decided not to hold a conference in 1994. However, it is anticipated that one will be held next year which will probably be of a similar format to the very successful 1993 one.

SHAREWARE CORNER

LES HAMILTON

The questionnaire I sent out following RIG 34 confirmed that RIGHTIME, VPIC and NEOPAINT are our three most popular programs. The least popular is the weather forecasting program WX-43. Now a similar, but much better, weather predicting program called WEATHER 350 has been added to disk U-01. There has been quite a lot of interest in the new astronomy disk so more programs have been added.

The first four programs reviewed below are referred to in "Archiving Wxsat Images on the PC" elsewhere in this issue and are on the new disk I-03 Other reviewed shareware is offered additionally, until the end of May, on disk RIG-36.

SHAREWARE REVIEWS

JPEG4386 - contains the Independent JPEG Group's free software. It runs on 386 and 486 machines under MS-DOS and consists of two utilities. They are CJPEG.EXE, which converts GIF images to JPEG format and DJPEG.EXE which does the reverse. I converted the 423Kb GREENLND.GIF file and in under 25 seconds had a 150Kb GREENLND.JPG file. That was with the default "quality" setting of 75. Typing "CJPEG -quality 50 GREENLND.GIF" resulted in a 96Kb JPEG file. Decompressing these JPEG files created GIF files of 434Kb and 417Kb respectively, which I found indistinguishable from the original. [Disk I-03]

LVIEW - is a Windows program with which I produced excellent JPEG images less than a fifth the size of the original GIF files. LVIEW is also an image editor/enhancer with all the usual facilities and there is an extensive on-line HELP menu. The facility to move part of an image is very useful. On images where the sync. has slipped during reception realignment is easy. LVIEW is a new (1993) FREEWARE program and no registration is required. [Disk I-03]

WINJPEG - is a Windows program for 286 CPU machines. A 386 version is provided on registering. It is very similar to LVIEW but is designed more as a viewer than an image processor. The more usual image manipulating features are available. [Disk I-03]

COLORVIEW v 2.1 - is a DOS program capable of viewing and interchanging between JPEG, GIF and BMP formats. The file-type saved is controlled by simply changing the extension to GIF, JPG or BMP. COLORVIEW offers filters, colour enhancement tools, gamma correction, image flips and rotations, clips,

resizing, cutting and pasting. COLORVIEW will operate on 24-bit images but only 8-bit colour is displayed. For Windows users COLOURVIEW v 0.97 is available but it neither saves to JPEG format, nor has cut and paste facilities. These are anticipated for version 1.00. [Disk I-03]

BIRD-DOG - must be one of the best visual satellite tracking programs to come on the shareware scene yet. The opening screen displays up to 16 satellites on a Mercator world map. The names of the satellites are shown in a browser and are selected with the cursor keys. You can flick through the list to see where any satellite is at any instant and as satellites come into range of your ground station, their names are highlighted. Key f4 toggles time-lapse mode, allowing the satellites to move rapidly, while f3 offers an interesting still-frame option, where the Earth is shown as it would be seen from the selected satellite. A predict option draws the selected satellite's ground track and also calculates ephemerides, which can be viewed on screen or printed out. BIRD-DOG runs from NASA 2-line element sets and expects to find a file called KEP.LOG. They are then processed into a file named BIRD.DAT. This process is a little fiddly and it is best to read the documentation before trying any changes. BIRD-DOG is free and is on Disk T-02.

CLOCKWORK - claims to keep your system's clock on time. Some of you have reported conflicts between RIGHTIME and other programs but as CLOCKWORK is active only when called up to correct the computer's clock and is not a TSR, it should not interfere with other programs. Registration is $15. [Disk U-01]

PRESAT - is a prediction program which operates from files in NASA 2-line format. Site co-ordinates and other constant parameters are entered just once and retained on file. Further information needed to run the program is most conveniently entered by use of the batch file PRESAT.BAT which I have included in the archive. Predictions are made at user-defined intervals for every satellite that comes above the horizon. Information presented includes UTC, azimuth, elevation, latitude, longitude, altitude, range, R.A., declination and visibility. This final feature is intended for "satellite spotters" and indicates when, during hours of darkness, the satellite is in a position to catch solar illumination. The output may be directed either to screen, printer or file. PRESAT is a user-friendly program, which produces its data quickly and efficiently. It is Public Domain software so there is no registration charge. [Disk T-01]

PHOTOLAB - is another GIF/PCX/BMP image viewing and enhancing program. It works under Windows and has one useful advantage over most of its competitors. An image can be enlarged or reduced merely by clicking the mouse over it. Reductions go in 10% increments per mouse click (down to 10%

minimum), while enlargements are 100% per mouse-click (up to 1000%). Registration costs $30. [Disk I-02]

UPGRADE NEWS

IMPROCES V 4.0 - is a major upgrade of the powerful image enhancement and painting package for GIF and PCX images. Although not a Windows program, IMPROCES - operates through an extensive pull-down menu system. Unfortunately, this version is known to "lock up" on some video cards, which is why V 1.0 is still being made available. I use a Trident 8900 card and V 4.0 is great. [Disk I-01]

PAINTSHOP PRO V 1.02 - is a superior Windows version of Paintshop. To get the best out of it, you must have Windows itself operating in a 256-colour mode. Otherwise PAINTSHOP PRO optimises all images by dithering down to 16 colours. [Disk I-02]

COMPUSHOW V 8.61A - is a new version of the GIF viewer, which comes close to the registered version in functionality, as the annoying start-up screen has been removed. All functions are now accessible with the mouse which is a great improvement. To print images you still need the registered version. [Disk V-01]

GEOCLOCK V 5.0 - is now fully mouse operated with an icon bar on screen for most functions. A world-wide choice of locations is available and there is now a map of Europe. [Disk T-02]

SHAREWARE LIBRARY INDEX PC only. * denotes Windows required.

Disk A-01	CIRCUMSPACE V 1.0 (Space travel simulator)
	SKYGLOBE V 3.5 (Planetarium simulator)
	SKYMAP V 4.5 (Plots satellite tracks on starfields)
	*STARBASE V 1.4 (Skymaps & database; shows stars, planets etc.)
	STARWARE V 3.2 (Planetarium simulator)
Disk A-02	*PLANETWATCH V 1.0 (Animated graphics of Solar System)
	SKY PLANETARIUM V 2.2 (Planetarium)
	SOLAR (Solar eclipse predictions)
	STARRY SKIES V 6.6 (Planetarium simulator)
Disk C-01	DSZ2201 (ZMODEM protocol driver)
	JVFAX V 6.0 (APT, FAX, WEFAX etc. receiving program)
	MSF (TSR to set PC clock from Rugby clock)
	SSTV-FAX (Receive/transmit SSTV FAX)

Disk F-01 CUT-NOAA (Trimming program for large .NOA files)
DAT2PA2 (Meteosat .DAT to .PA2 conversion program)
JOIN-PIX (Joins PROsat II C02 and C03 images together)
NOATIF V 3.0 (Converts .DAT, .NOA, and RAW files to TIF)

Disk I-01 GRAPHICS WORKSHOP V 6.1 (View/dither/print for GIF etc.)
IMAGE DISPLAY V 7.9 (GIF viewing and enhancing program)
IMAGE PROCESS V 1.0 (GIF editing program)
IMAGE PROCESS V 4.0 (GIF editing program)
*WINGIF V 1.4 (Viewing/enhancing program for GIF)

Disk I-02 GSIP V 1.0 (PCX image viewing/enhancing program)
*GWSWIN V 1.1 (Graphics Workshop for Windows)
NEOPAINT V 2.2 (GIF, PCX, TIF view/edit/paint program)
*PAINTSHOP PRO V 1.02 (Painting/viewing program)
*PHOTOLAB V 1.8 (Superb Windows GIF viewer)

Disk I-03 COLORVIEW V 2.1 (View/enhance/print prog for GIF/JPEG)
*COLORVIEW V 0.97 (Windows version of above)
JPEG4386 (DOS JPEG-GIF compression/decompression)
*LVIEW V 2.5 (View/enhance/print prog for GIF/JPEG)
*WINJPEG V 2.1 (View/enhance/print prog for GIF/JPEG)

Disk T-01 PCTrack V 1.1 (Satellite tracking program - simple to use)
PCTrack V 2.14 (Latest version - uses 2-line elements)
PRESAT V 2.1 (Satellite predictions from 2-line elements)
STS ORBIT PLUS V 9338 (Superb satellite tracking program)
TRAKSAT V 2.80 (Satellite tracking and data tabulation)

Disk T-02 AOS-TIME (Basic program to predict best sat. passes each day)
BIRD-DOG V 2.0 (Track satellites in real time on world map)
EDSAT V 1.6 (For manipulating NASA 2-line element files)
ELEMENT MANAGER V 2.2a (For NASA and Amsat files)
GEOCLOCK V 5.0 (Track night and day on Earth maps
LEARNORBIT (Teaching program about satellite orbits)
TRAKSTAR V 2.15 (Tabulate/print ephemerides tables)

Disk U-01 CLOCKWORK V 4.9 (Keeps CMOS clock on time)
DOWN (Autodown and Prodown for PROsat II)
GIFDOT v 2.0 (GIF printer routine for dot-matrix printers)
HURRTRAK V 4.0 (Hurricane tracking program)
RIGHTIME V 2.54 (Keeps CMOS clock on time.)
SCREEN THIEF V 1.01 (One of the best screen-capture TSRs)
TIMESET V 7.21 (Sets your computer via atomic clock)

VGA CAPTURE V 8.0 (Resident screen capture program)
WEATHER V 3.50 (Weather forecasting program)
WX v 4.3 (Weather forecasting program)

Disk V-01 COMPUSHOW V 8.61A (GIF viewing program)
GIFDESK V 4.0 (GIF viewing/resizing/cataloging)
GIF-REED V 4.12 (GIF viewing/enhancing program)
VPIC V 6.0E (GIF viewer/file format converter)

Disk RIG-36 BIRD-DOG V 2.0 (Track satellites in real time on world map)
CLOCKWORK V 4.9 (Keeps CMOS clock on time)
GEOCLOCK V 5.0 (Track night and day on Earth maps)
HURRTRAK V 4.0 (Hurricane tracking program)
MSF (TSR to set PC clock from Rugby clock)
PRESAT V 2.1 (Satellite predictions from 2-line elements)
SSTV-FAX (Receive/transmit SSTV FAX)
TRAKSTAR V 2.15 (Tabulate/print ephemerides tables)
WEATHER V 3.50 (Weather forecasting program)

HOW TO OBTAIN COPIES OF THE SHAREWARE LIBRARY DISKS

SEND UP TO A MAXIMUM OF 6 FORMATTED 1.44 MB MS-DOS 3.5" DISKS PER REQUEST TO:

LES HAMILTON, 8 DEESIDE PLACE, ABERDEEN AB1 7PW, SCOTLAND.

Disks must be sent in a sturdy, resealable package such as a Jiffy bag, or a package within a package, and each separate request must be accompanied by:-

i) a self-addressed adhesive label
ii) stamps for the return postage
iii) coins (or additional postage stamps) to the value of £2.

Note that overseas members' return postage is free. However we would appreciate an exchange of shareware or satellite images in lieu.

Please send any new and updated versions of useful shareware to me at the above address. If you have any problems running any of the shareware from the RIG Library, please enquire by letter and I'll do my best to reply by return.

THE SOVIET & CHINESE SCENE

PETER WAKELIN

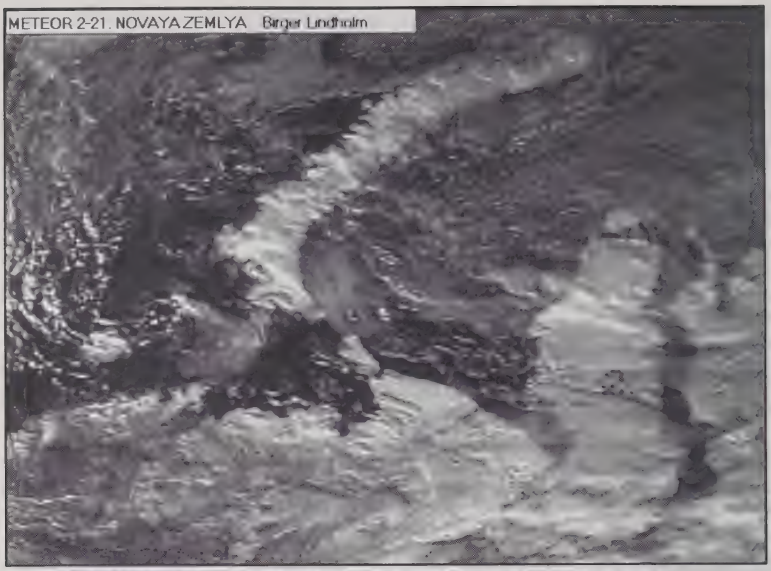
METEOR 3-3 continued transmitting into early December as expected with visible images only and was then switched off when precession moved its path toward the morning terminator (the day/night transition zone). By late February the north-bound passes will be well illuminated in the afternoons so we may see more from this one. If we do, it will be from a greater height. Once again, it was Len Maxim in Wellington who first reported the upward manoeuvre in mid December. The nodal period was increased from 109.74 to 110.43 minutes between 13 and 17 December which is equivalent to a height increase of 32Km. Unlike the manoeuvre of METEOR 3-4 reported last time this one appears to have been made by a very low thrust engine operating for a longer period. Meteor 10 launched in 1971 was the first to test an ion-plasma low thrust engine for orbital corrections.

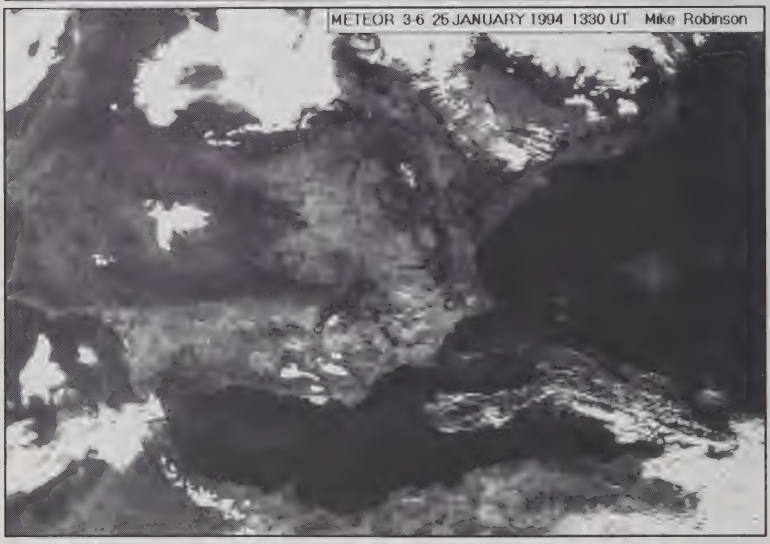
Nothing has been reported from METEOR 3-4 since last July. It precessed through midday and maximum illumination in January without imaging but, in view of the recent happenings on METEOR 3-5, I am not going to pronounce it dead yet!

After 13 months without imaging METEOR 3-5 came back to life on 30 November. Not only did it produce very good visible images but it switched to 20 line/minute IR imaging during its passage over the night side of the Earth. More on these images appears elsewhere in this issue. It was later learned, from Len Maxim, that a Russian FANAS prediction bulletin stated that it would be switched back on.

A later prediction bulletin, also from Len, and issued in Moscow on 11 January at 0945UT reported that METEOR 3-5 would be switched off from 24 January. This was interpreted as a strong hint that METEOR 3-6, due up on the 25th, would transmit on the vacated frequency of 137.30MHz. The third successful launch of 1994 put METEOR 3-6 into an orbit with the usual parameters early on the 25th, just a few hours after an Ariane rocket deposited its $300 million payload in the Atlantic. A small secondary payload, TUBSAT-B (Technical University of Berlin SATellite) was launched with the Meteor and separated from it after about 4 orbits. A joint Russian/German/French payload is also on board the Meteor. Called SCARAB (SCAnner RAdiatsionnogo Balansa) it will measure the Earth's radiation budget. Another SCARAB will be launched on a Meteor in a plane at 90 degrees to METEOR 3-6 "during 1994".

Several members received images within 12 hours of the launch and Dennis


METEOR 2-21, NOVAYA ZEMLYA Birger Lindholm

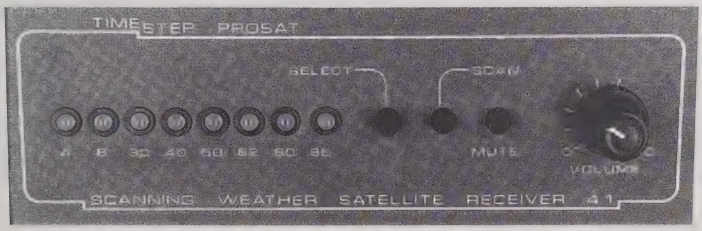

METEOR 3-6 25 JANUARY 1994 1330 UT Mike Robinson

Kenny of Haywards Heath was one of the first to hear it without having prior knowledge of the launch. The accompanying image was received from Mike Robinson in Accrington. He sent me the entire pass on a 1.44Mb disk using Stacker which gave me greater flexibility in tweaking and cropping the image for publication. It was not possible to find any detail in the "crushed" whites but, hopefully, when the check-out phase is complete we shall see some good imagery from this one. From the few images I have seen so far from this spacecraft the ground detail shown suggests that a redder window may be in use.

METEOR 2-21 continues to transmit at a very variable signal strength. The images are mostly poor but I find that I can usually get a couple of minutes of good quality signal when the satellite is northbound and approaching the northeast horizon. Birger Lindholm, who lives in southern Finland also got a good signal in the northeast and he sent me the image of Novaya Zemlya.

There's nothing to report on the Chinese scene except to remind readers that February 1994 was quoted (admittedly, quite some time ago now) as being the earliest launch date for the new, geostationary Feng Yun 2A. ●

RIG-TIMESTEP PROscan POLAR RECEIVER



A professionally made scanning receiver covering all NOAA and Soviet Polar Orbiting Satellites. The frequency can be readily seen via an LED on the front panel and unwanted channels can be locked out. It is designed with a lot of internal filtering, making it ideal for locations that suffer from Pager problems. It is resistant to pager interference at 1 to 2 miles (where the field strength is at maximum), and also carries an unconditional money back guarantee. *See RIG32 page 88 for further details.*

For the latest prices of the above equipment see Rig Shop Corner

KEPLER ELEMENTS

NOAA9
1 15427U 94030.85754099 0.00000106 6933
2 15427 99.0709 79.6136 0014249 247.4940 112.4724 14.13584243470947
NOAA10
1 16969U 94030.87446357 0.00000080 5971
2 16969 98.5113 44.0548 0013983 14.1154 346.0414 14.24860838383050
NOAA11
1 19531U 94030.90850576 0.00000129 5014
2 19531 99.1598 16.5427 0011803 155.4181 204.7555 14.12954794275834
NOAA12
1 21263U 94034.89214603 0.00000163 9120
2 21263 98.6320 65.5201 0012047 264.3077 95.6728 14.22364495141582
METEOR3-3
1 20305U 94034.92211152 0.00000044 9809
2 20305 82.5539 2.1167 0005838 263.7020 96.3431 13.04423910205522
METEOR3-4
1 21232U 94032.12779086 0.00000051 6674
2 21232 82.5420 265.7828 0013008 161.7732 198.3861 13.16459852133456
METEOR3-5
1 21655U 94031.52098998 0.00000051 6638
2 21655 82.5520 213.2454 0012989 174.8683 185.2566 13.16827699118476
METEOR3-6
1 22969U 94033.89365713 0.00000626 150
2 22969 82.5645 151.0039 0014674 238.3166 121.6526 13.16722189 1172
METEOR2-21
1 22782U 94032.21037544 0.00000059 2596
2 22782 82.5501 314.1919 0020900 247.4078 112.4878 13.82998426 21292
Above elements from Timestep BBS

INFORMATOR 1 / OSCAR 21
1 21087U 94022.59338267 0.00000094 418
2 21087 82.9419 250.4472 0036136 127.9378 232.5054 13.74532122149583

Frequencies: NOAAs 9/11 137.62MHz, NOAAs 10/12 137.50MHz
METEORs 137.30, 137.40 or 137.85MHz

Explanation of elements format above:
Line 1: NORAD catalogue number, Epoch, Decay rate (NDOT/2), Bulletin number (thousands omitted), Checksum (1 digit).
Line 2: NORAD catalogue number, Inclination, Right Ascension, Eccentricity (decimal point omitted), Argument of perigee, Mean Anomaly, Mean motion (8 decimal places), Rev. number, Checksum (1 digit)

MEMBERS' LETTERS

Dear Editor,

Following Andy Middlethwaite's letter in the last Journal about the Metfax service, I am writing to tell you about my reception of this service using a pocket fax-modem. I purchased the modem, a Pace Microlin/fx, primarily to download satellite orbital elements from the RIG BBS but thought I'd try my luck at receiving Metfax charts using the supplied software, DOSFAX & WINFAX LITE. I had success with WINFAX and am now able to view charts and images. It has a zoom facility and can also direct output to a printer. I hope this is helpful to anyone who would like to use this service but doesn't have access to expensive fax machines.

I would also like to point out that the 'phone numbers quoted in Mr Middlethwaite's letter differ from those I was given.

Yours etc., Bill Clark, 85A Lawson St, Aspatria, Carlisle, CA5 3DR.

[Mr Clark provided a list of numbers which were different so I sought clarification from the Metfax Helpline on 0344 854435. There are four separate services tailored to meet the needs of different customers. We cannot list all the numbers but the four index pages are available on:

Metfax General	0336 400 400	Metfax Marine	0336 400 401
Metfax Aviation	0336 400 501	Metfax Education	0336 400 480

These index pages each take about two minutes to download and premium-rate charges apply. Ed]

Dear Peter,

RIG members downloading .ZIP files from bulletin boards should be aware of a problem that has come to light recently. I am indebted to Peter Finn for the disclosure that, if you are using PKUNZIP v 1.1, some of the more recently created .ZIP files will not extract. Peter downloaded JVFAX60.ZIP only to find that his copy of PKUNZIP produced a catalogue of "can't do" reports.

PKZIP and PKUNZIP were upgraded to version 2 early in 1993 and, although they are backwards compatible, the reverse is definitely not true. If you acquire .ZIP files created AFTER the end of 1992 you are advised to use PKUNZIP v 2.04

for the decompression. I have added it to the Shareware Library Disk U-01 should any member require a copy.

Yours, Les Hamilton, 8 Deeside Place, Aberdeen, AB1 7PW, Scotland

Dear Henry

I'm still playing with designs of receivers for geostationary and polar satellites. I've come up with another one recently. It's the front end of a Cleartone 351E ex-pmr which has four stages of helical filtering. I fitted a synth. unit out of an old optiscan scanner in place of the rocks, a SFA10.7F ceramic filter as the 1st filter and a CFM455A as the second. I've done away with the CA3089 limiter/detector and used a NE565 PLL as the detector at 455 KHz. These are very linear in response - far better for WEFAX reception than normal IF discriminators. The results, so far, are very promising with superb pictures. Paging interference, - what paging interference? I have a BT RF site 500m away in full view of my antennae but not a whisper! The only thing I must have a more detailed look at is the precise IF bandwidth. The problem is that the widest 455 filters are the CFM455As at 35 KHz 6db which may not be quite wide enough but they set a good passband.

I will document my final system when I eventually get there!

Best 73, Bob Cowling G8ZWF, 3 Braidway Court, Upper Battlefield, Shrewsbury, SY4 4AB.

A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

WeatherSat Ink

The Environmental Satellite Applications Journal

4821 Jessie Drive, Apex, NC 27502, USA

$15 US per year $20 all others, US funds
MasterCard / Visa OK with $1 surcharge

RIG AT RALLIES

For those members who are not radio amateurs, a brief explanation of the term "Rally". These are events normally organised by local radio amateur clubs and societies and are held in schools halls or just outside town in marquees in local fields. There is normally parking space provided and a small entrance fee is normally charged.

They consist of trestle tables containing new and used equipment and components, from traders in the electronics and computer field, often at knock down prices. (Many resemble the familiar car boot sale.)

There are also displays and demonstrations by radio related societies and organisations (such as RIG). They normally start at 10.00 or 10.30am and fizzle out at around 4.00pm. They are normally signposted from the town in question by small signs attached to road signs, etc. reading "Radio Rally", "Rally", or the initials of the society, such as "ERAS", etc.

IMPORTANT... If you visit a rally in order to purchase RIG goods please give Henry a ring a couple of days before, so that he can put them on one side for you, as only small quantities are normally taken.

We hope to attend the following again this year...

March 12-13	Picketts Lock, Edmonton, North London (off M25)
May 1	BATC, Ryton-on-Dunsmore, Coventry (new venue)
May	NEC Birmingham Exhibition Centre
June 5	Springfields, Spalding, Lincolnshire
June 12	Elvaston Castle, Derbyshire
June 26	Longleat, in grounds of Wildlife park
July 2/3	Hamfest Stafford
July 3	York, Racecourse
August 7	Woburn Abbey, Bedfordshire, in the grounds
September	Lincoln, Showground
September 11	BARTG, Sandown Racecourse, Esher, Surrey
September	Peterborough, East of England Showground
October	Leicester, in the Granby Halls (2 days)

We are always pleased to see volunteer members at these rallies, especially those who live locally to the event, who can help out on the RIG stand for a short while and give the regulars a break during the day.

RIG HELPLINES

General enquiries Meteosat information NOAA information Supplier complaints	John Tellick	081 390 3315

A copy of the Group's rules can also be obtained from John Tellick

Russian and Chinese satellite information	Peter Wakelin	0344 23200
HRPT	Peter Wakelin	0344 23200
PDUS	James Brown *(not available on Sundays)*	0656 782632
Schools/educational co-ordinator	John Tellick	081 390 3315

Schools/educational enquiries	John Murray	Torquay	0803 217754
	Frank Bell	Godalming	0483 416897
	Tom Walter	Reading	0734 871330
	Bob Coombes	Haslemere	0428 642930
	John Din	Bristol	0454 773387
	Alan Wright	Norwich	0603 713449

Framestore technical support	Mike Coombes *(7.30pm-9.30pm)*	0530 243494

Microcomputer specialists:

PC and printer problems	Mark Pepper *(10-1pm Mon-Fri. Ask for Rob Pepper on Ext. 2132)*	0494 471111
BBC microcomputer	John Tellick	081 390 3315
Commodore Amiga	Chris Pretty	0420 82752
Archimedes	Tom Walter	0734 871330

NOTE: We are grateful to the above members for offering their services to the Helpline. Please do not abuse the service by ringing them for queries other than those listed against their names.

REMOTE IMAGING GROUP
RIG SUBSCRIPTION - NEW MEMBER

If you would like to become a member and receive the Journal, photocopy this page, complete the form below, sign the declaration and send it to...

RIG SUB, PO BOX 142, Rickmansworth, Herts, WD3 4RQ, ENGLAND

The subscription rates for 1994 are...

UK membership	£10.00	Europe outside EC	£12.00
Europe EC	£12.00	Outside Europe	£14.00

Name _____ Call Sign (if any)_____

Address. _____

_____

_____Post Code_____

Country _____ Telephone No._____

Are you receiving:
Polar Orbiting Weather Satellites _____ Geostationary Weather Satellites _____

Do you require Back issues? (see Rig Shop Corner) _____

Amount Enclosed £_____

Are you willing to have your name/address made known to members in your area? YES / NO. *(Delete as applicable)*

DECLARATION: I do NOT object to the Remote Imaging Group holding my Membership details on a computer.

Signed _____ Date _____

RIG SHOP CORNER

*** ALL PRODUCTS FOR SALE TO RIG MEMBERS ONLY ***
*** FOR THEIR OWN PERSONAL USE ***
*** NOT FOR SELLING-ON ***

All prices shown include post and packing except where marked

Receiving Equipment	**UK/EC Price**	**Overseas Price**
RIG DARTCOM Meteosat Downconverter. Assembled and tested module in tin plate box	£155.00	£132.00
Complete, assembled and mounted in weather-proof box.	£190.00	£162.00
RIG DARTCOM VHF Scanning Receiver. Assembled and tested module with LED channel number display.	£135.00	£115.00
As above but with LCD frequency read-out instead of LED channel number display. *Both the above items are modules and require a box, together with several components, switches, etc.*	£179.00	£152.00
RIG TIMESTEP PROscan Receiver. *See advert in this issue.*	£191.00 *Special Rally Price*	£163.00 *£185.00*
RIG VHF Preamp. Includes a bandpass filter and is ideal for mast-head mounting. Assembled/tested module; needs boxing.	£24.00	£20.00
RIG TIMESTEP VHF Preamp Built and tested, in diecast box, 12vdc coax-fed	£24.00	£20.00
RIG 1695MHz Low Noise Amplifier kit. *Experienced constructors only.*	£29.00	£25.00
Computer Software/Hardware		
RIG TIMESTEP PROsat II, IBM/PC Compatible System. *See main advertisement.*	£100.00 *Special Rally Price*	£90.00 *£98.00*

Antenna systems

RIG CROSSED DIPOLES
A Turnstile type design, in kit form *(available in UK only)* incl. P&P £26.00
Special Rally Price £20.00

DISHES *(Available in UK only - Prices do NOT include P&P, see below)*
1.0 Metre (dish only), nearly new condition £25.00
Dish Feeds £25.00
The above dish prices are for collection from the Chairman, or by prior arrangement at rallies or exhibitions. (Please ring the Chairman for details of availability of dishes and feeds).

RIG Binders
Available by post from Gordon Fleming, 168 Blythway, Welwyn Garden City, Herts. AL8 1DU. UK Price £4.00 each, EC/European Price £4.50, Outside Europe Price £5.00. Cheques to *"REMOTE IMAGING GROUP"* please.

Back Issues of RIG Journals

		Rally Price	UK Price	EC/Europe Price	Outside Europe Price
RIG 8-11	1987	£4.00	£5.00	£6.00	£7.00
RIG 12-15	1988	£4.00	£5.00	£6.00	£7.00
RIG 16-19	1989	£4.00	£5.00	£6.00	£7.00
RIG 20-23	1990	£5.00	£6.00	£7.00	£8.00
RIG 24-27	1991	£5.00	£6.00	£7.00	£8.00
RIG 28-31	1992	£5.00	£6.00	£7.00	£8.00
RIG 32-35	1993	£5.00	£6.00	£7.00	£8.00

Note: Prices quoted are for a set of four, including Post and Packing.
RIG 1-7 are currently out of print. Owing to depletion of some issues, photocopies may be supplied. Individual issues are no longer available (hardship cases excepted).

Ordering Information
All items are available from the Chairman, Henry Neale (except where marked) and include return by UK 1st class mail (except dishes and Journals). Items to non-UK addresses sent via airmail.

UK VAT is now applicable on sales to the following EC countries - France, Germany, Belgium, Portugal, Spain, Republic of Ireland, Denmark, Italy, Luxembourg, Netherlands, United Kingdom (including Isle of Man). Members in these countries should use UK/EC price when ordering. EC members who are registered for VAT must forward their VAT registration No. to the Treasurer to enable them to receive VAT exempt goods.

As UK/EC prices now include VAT where applicable; receipts will be issued upon request. Remote Imaging Group VAT Registration No. 594 7483 83. Channel Isles: divide by 1.175 to remove VAT content.

UK members, By Cheque or Postal Order. **Overseas members,** Pay by Bank Draft (drawn on a UK London-based bank) or Eurocheque(s). (Payments to a Maximum of £100.00 in any one Eurocheque). No local currency please.
All cheques made payable to *"REMOTE IMAGING GROUP".*

Owing to increases in postage, insurance and other costs we regret that some prices have had to be increased.

Credit Cards Accepted (Access/Visa/Mastercard/Eurocard) Add 3% to Total. Available by MAILORDER only from the Treasurer, Mark Clarke, 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ.

Please state type of card, Card No., Expiry Date.
All Credit Cards authorised before goods are despatched.
(Note: Ordering by Credit Card does not mean instant despatch!)

UPGRADES...

PC-SAT3 to PCwSatIII Update disk. Dec. 1992, as mentioned in RIG24, incl. MET3-4. £3.00 handling charge, state disk size required.

PROSAT-II Update disk, July 1993, all new features, see main advertisement, £15.00 including P&P. 3.5" disks sent unless advised to the contrary.

SNOISE, Signal to noise measuring program for Meteosat (for ProsatII system only) Send disk and return S.A.E.

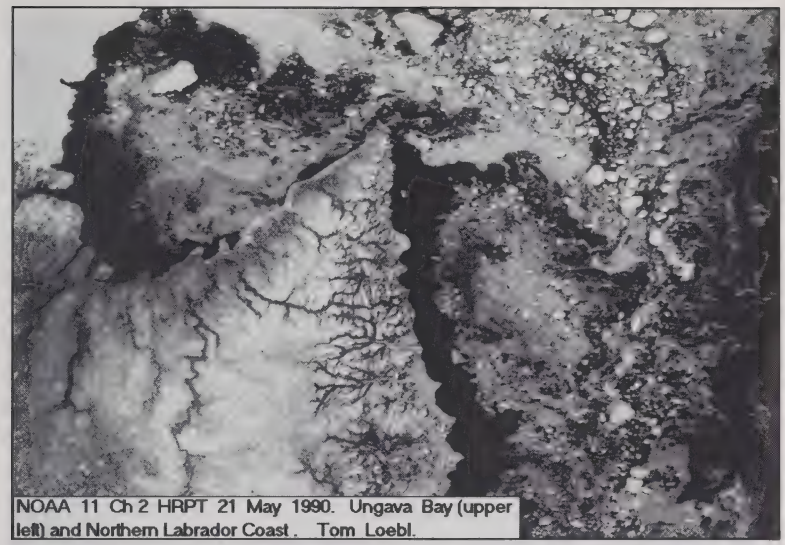
TIMESTEP HRPT DEMO DISK, 1.4Mb. £3.00 handling charge.

OFS WEFAX DEMO DISK, 1.4Mb. £3.00 handling charge.

All upgrades available only from the Chairman.

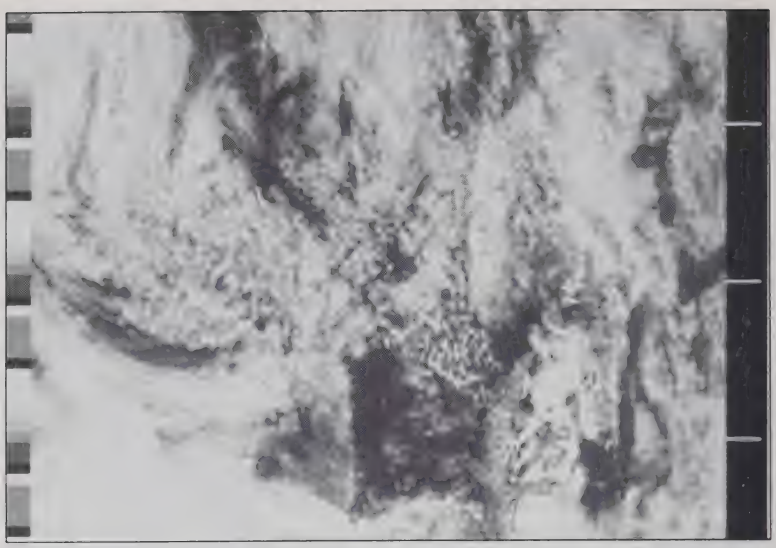
THE IMAGES ON THE FOLLOWING PAGES

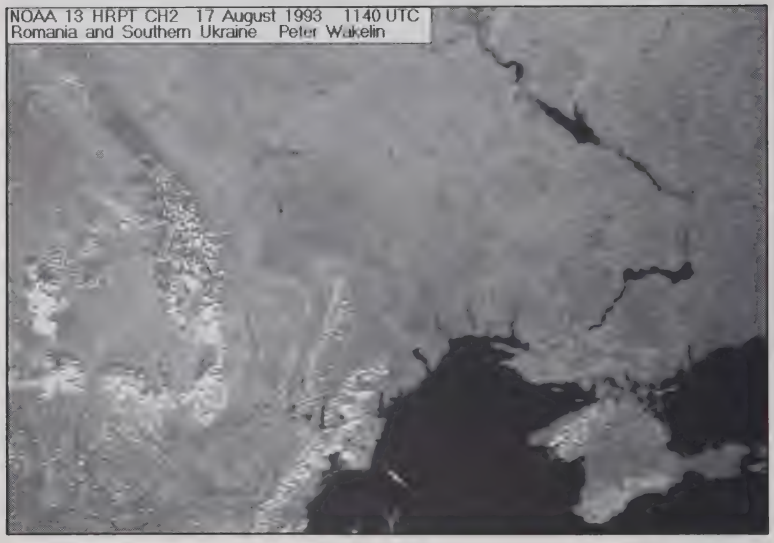
Two NOAA HRPT images from Tom Loebl appear on page 69. Further information appears on the images. The image at the top of page 70 was received from NOAA 13 just a few hours before it failed by Michael Gill. Below, and on page 71 are NOAA 13 images from Peter Wakelin.



NOAA 11 Ch 2 HRPT 21 May 1990. Ungava Bay (upper left) and Northern Labrador Coast . Tom Loebl.

NOAA 10 CH 2 HRPT 25 March 1991. Gaspe Peninsula at the mouth of the St Lawrence River. Manicougan Lake (top left) is probably an ancient meteor crater. It is about 50 Km across. Tom Loebl




NOAA 13 HRPT CH2 17 August 1993 1140 UTC
Romania and Southern Ukraine Peter Wakelin

NOAA 13 HRPT VIS CH2 14 AUGUST 1993 1210 UTC Peter Wakelin

RIG - TIMESTEP PROSAT II

New Features

New purchasers will be pleased with a price reduction to £98.00. Remember the package already includes latitude and longitude gridding on NOAA and now Meteor, direct temperature calibration on NOAA, 100 frame stand alone animation, full satellite data capture and save regardless of video card type.

.BMP Windows export... This will export any screen, in any zoom, in any contrast stretch and or colour in to a .BMP file which is the default for all Windows applications. The Paintbrush program will print in 256 colour and add annotation, even though it won't colour edit in 256 colour mode. All the Windows supported printers can be accessed from Paintbrush.

NOAA Schedule... This allows you to pre-set reception of up to 20 different polar orbiting satellite passes.

Meteor Gridding... The impossible at last ! We can't guarantee this, but our tests indicate that we have cracked the problem of latitude and longitude gridding of Meteor images.

LaserJet 4 600DPI... There is a new driver that allows 32 greyscale printing of images using the new HP LaserJet 4 printer.

Dot Matrix printers... Both 9 and 24 pin dot matrix printers are now fully supported.

Auto Colour... For visible light images from Meteosat, we now have a really clever auto colour function. Just click on the button and false colour will be calculated and applied. Has to be seen to be believed !

Instant Contrast... Markers can be put on the colour/contrast scale by double clicking the mouse. They can be dragged up and down the scale using the mouse, giving instant contrast adjustment.

Annotation... Both the NOAA and Geostationary programs now have built in annotation facilities. This allows marking of features such as cities and weather phenomena. It is switchable on or off and does not change size as zoom ratios are used.

There have been some significant upgrades to PROsat II for 1993. A new set of discs and a new manual is available from Henry for £15.00 for previous purchasers. The upgrade reflects the needs and suggestions of RIG member.

SAMPLER DISCS

DISCS £2.00 EACH
ALL 5 £8.00 VAT INC.

The Weather Desk

Multi-tasking Weather Satellite
Image Gathering System

JPEG DEMO: A selection of 24bit images processed by *PDSview* in compressed JPEG format, from a variety of spacecraft, including NOAA, Landsat, SPOT, Voyager, Meteosat. Needs RISC OS 3.

SPRITE DEMO: A selection of Sprites processed in *PDSview* and the *Weather Desk* in compressed !Squash format. Needs RISC OS 3

PDSview

General Purpose Image Processor

WHOLE EARTH DEMO. A composite infra red/visible light animation of the whole Earth from Meteosat. Shows moving weather pattersn as well as day/night illumination of the sun. Collected by the *Weather Desk* and processed in *PDSview*. Needs RISC OS 3 and 4MB RAM.

EUROPE DEMO: An infra red movie sequence showing cloud movement over Europe.Sequence collected and automatically processed by the *Weather Desk*. Needs RISC-OS 3 and 4MB RAM.

!Orrery

The award winning model of the solar-system.

!ORRERY DEMO. A carousel demo showing some of the features of *!Orrery*. Runs with interactive help programme and provides some output.

spacetech

space science resources

21 West Wools, Portland, Dorset DT5 2EA. U.K. ☎. 0305 822753 Fax. 0305 860483

We know most RIG members use DOS machines, but why not take a demo disc into your local school and try it on an Acorn?

FOR **Acorn**

AMIGASAT 3.1 Decode Package

A Powerful Weather Satellite Processing Package for the Commodore Amiga Computer Range

Amigasat has long been renowned for its excellent DSP and image processing power. The new version builds on that reputation to provide a first class package providing numerous image processing techniques which are both powerful and easy to use.

The Amiga range of computers was originally designed as a video processing platform, and so it is no surprise that it excels in this department. Commodore have launched three advanced new machines (1200, 4000) having the new AGA graphics chip set, which provides superb high resolution graphics. The Amiga is a multitasking machine, and Commodore include AREXX, a powerful programming language which enables the new version of Amigasat to be readily configured in every aspect for a particular task - easily!

Most decode packages have some feature or other to separate them from the rest - of the many packages that we have seen, Amigasat stands in a class of its own as the best all round performer.

Check out some of its many features...

- *Automatic image capture using Meteosat or GMS digital headers*
- *Stored resolution to 2048 x 2048 x 256! (e.g. full 17min polar pass)*
- *Extremely powerful, yet simple to use software*
- *Direct input of other IFF or GIF files (such as RIG GIF library) for image processing*
- *SupportAs AREXX, with over 60 built-in commands,allowing powerful customization of Amigasat applications*
- *Most advanced digital signal processing techniques used for out-standing image quality*
- *Full control over animation, with or without hard disc*
- *Runs in Amiga's own multi-tasking environment*
- *Multiple on-screen colour images*
- *Mathematical mixing of multiple images*

still only
£139.95
excl. VAT & carriage

If you would like to receive our information pack on the Amigasat, or any of our other products, please call or write to the address below. Upgrades from earlier versions of Amigasat, or other systems available.

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, Hants. GU34 3AW, U.K. Tel/Fax (44) 0420 82752

MSR40B Synthesised Satellite Receiver

.....now featuring a microprocessor controlled synthesiser, and even greater interference rejection

Who wants to pay this much for a satellite receiver? We find that a major proportion of customers already own some kind of receiver but are suffering unacceptable levels of interference. To them the MSR40 has provided a solution to their interference problem which, frankly, they had thought insoluble.

Others simply buy it because of its excellent build quality, and features such as the S-meter, built-in power supply, the convenience of separate inputs for polar and Meteosat, or its remote control facility. Some just value our prompt and helpful after-sales service.

Whatever *you're* looking for in a weather satellite receiver, the new MSR40B is probably it.

If you would like to know more about the MSR40B, please call or write.

Features:

- *Extremely high interference rejection capability*
- *Microprocessor-controlled synthesiser*
- *Attractive, compact design*
- *Remote control facility*
- *Mains or DC power*
- *Separate inputs for Meteosat and VHF inputs*
- *Meteosat downconverter power via coax feed*
- *Signal level meter*
- *Intelligent Search and Scan modes*
- *Signal Level Output on rear panel (for dish setup)*
- *Constant output level when switching APT/WEFAX*

The MSR40 is sold on a money-back guarantee basis.

Price £295
(excl. VAT & carriage)

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton. Hants. GU34 3AW, U.K. Tel/Fax (44) 0420 82752

Timestep

** NEWS from Timestep **

Welcome to 1994 ! Those users of PROsat II will have been amazed at the land detail over Spain from the new Soviet **Meteor 3-6**. We have omitted the NOAA-Polar prices on this list as everything is available cheaper from the RIG shop corner. **PDUS** is looking up, the latest news is that a "limited set of data will remain un-encrypted", to celebrate this we have reduced the price of the complete system (only for a while !). **HRPT** is going really well in the U.S.A. but not here, so to encourage you to use our 10 bit software we have reduced the price of the complete system (UK RIG members only). **LANDSAT** images with stunning 30M resolution is available from us now. Anywhere in England and Wales is available in 30 x 30km data sets.

Meteosat

Meteosat is probably the best place to start your hobby. It sends images constantly. You could buy one of our ready to go systems, or you can buy the parts separately. Remember you do not need a NOAA receiver if you use our Meteosat Receiver. This will free your NOAA system to look for the Soviet polar orbiters, something every satellite enthusiast should be doing !

	Britain	EC Countries	USA	World
* 1.0M pole mount dish and feed	£199.00	£255.00	n/a	n/a
* Meteosat P-HEMT pre-amplifier	£255.00	£265.00	$450.00	£240.00
* 20M cable	£ 20.00	£ 23.00	$ 70.00	£ 22.00
* Meteosat receiver	£255.00	£265.00	$450.00	£240.00
* PROsat II card & software Colour Animate included with PROsat II	£199.00	£225.00	$349.00	£185.00
* PROSAT connecting cable	£ 15.00	£ 20.00	$ 30.00	£ 18.00
Dish feed (coffee can type)	£ 49.00	£ 59.00	$ 99.00	£ 66.00

* **Complete ready to go Meteosat system (less computer) £940.00 inc This is all you need to start receiving weather images every 4 minutes 24 hours a day !**

Image Processing

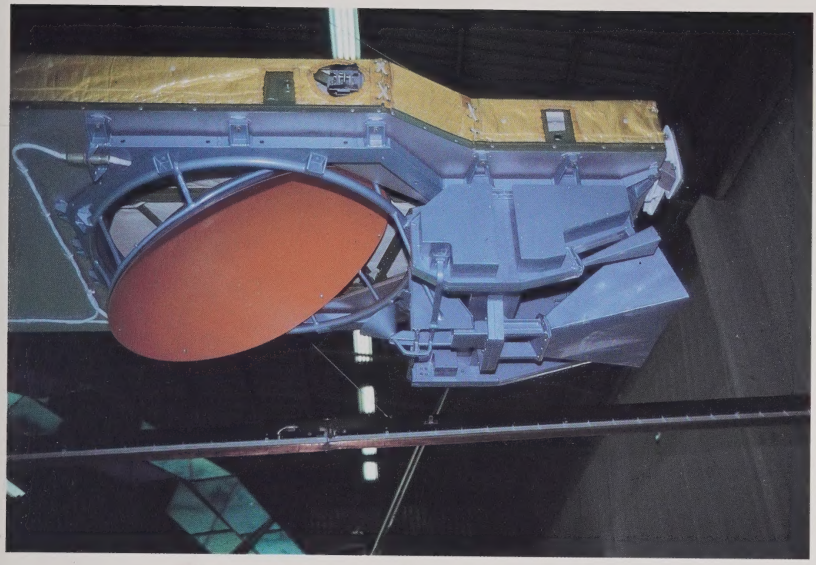
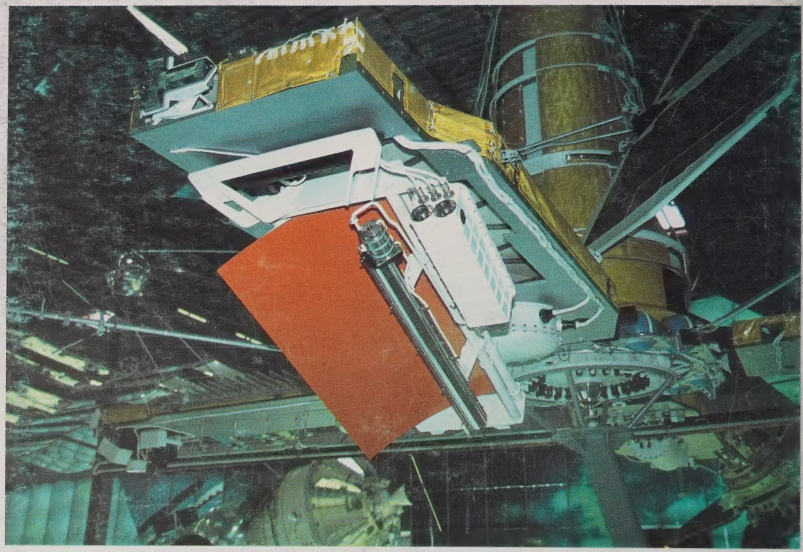
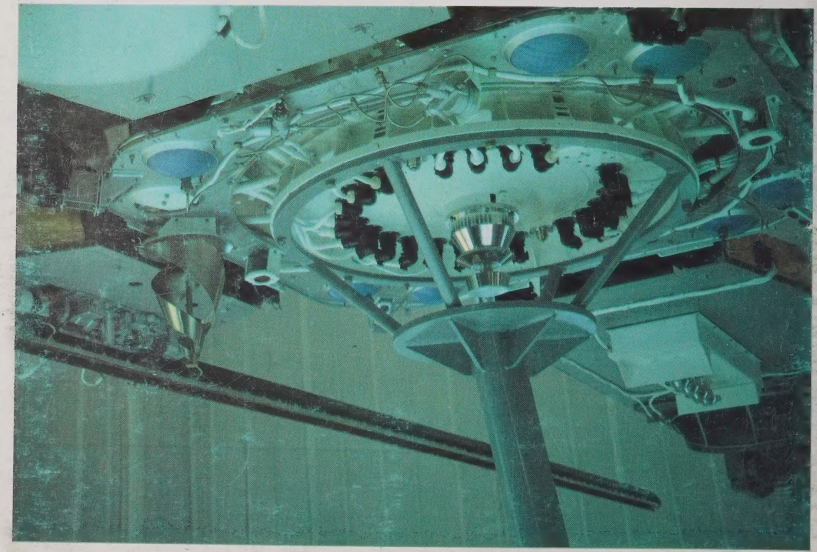
Multispectral View II including an image of your choice from England or Wales	£199.00	£225.00	$349.00	£185.00
24 bit video card	£ 99.95	n/a	n/a	n/a
Satview CD ROM	£ 39.95	£ 45.00	n/a	£ 35.00

Meteosat PDUS

	UK price (call for export)
1.6M dish (inc. patio mount and dish feed)	£399.00
Dish feed (included with the dish above)	£ 49.00
P-HEMP Preamplifier	£255.00
20M cable	£ 20.00
Extra 20M cable and line amplifier	£ 70.00
2 channel PDUS receiver	£499.00
PDUS PC/AT card and full software inc **colour animate**	£199.00

NOAA HRPT

90cm dish, dual feed, all metal work and galvanised ground stand	£299.00
90 degree combiner and cables	£125.00
Yaesu R5400 Az-El rotator	£469.00
25M control cables and heavy duty connectors pre-fitted must be ordered at the same time as the Az-El rotator	£125.00
Tracking card and software for automatic operation (needs separate computer) available early 94	£299.00
P-HEMT Preamplifier	£255.00
20M signal cable	£ 20.00
Extra 20M signal cable and line amplifier	£ 70.00
6 channel (5 fitted) HRPT receiver	£499.00
HRPT PC/AT card and full **10 bit** software	£199.00
Dish feed (dual polarity, for your own dish)	£ 59.00

All prices include :- VAT at 17.5% and carriage in Britain VAT and Air carriage to EC countries
Duty but not sales tax or carriage in N America (carriage is less than $10.00 and shipped from Boston Mass)
Air carriage (but not duty or tax) to other destinations. Spring 1994

Timestep PO Box 2001 Newmarket CB8 8XB
Tel. 0440 820040 Fax. 0440 820281